BWB-1 SERVICE AND REPAIR MANUAL

 Service Manual V1.1

BWB-1 Service and Repair Manual.

Contents.

Section.

1. Introduction.

Intended Use

This Repair and Service Manual contains instructions for the repair and maintenance of the Model BWB-1. This service information for use by **qualified personnel only!**

The Model BWB-1 is intended for use by persons knowledgeable in safe laboratory practices. If the instrument is not used in accordance with these instructions, the protection provided by the equipment may be impaired.

The information contained in this document was correct at the time of publishing. However, BWB Technologies UK, Ltd reserves the right to change specifications, equipment, and procedures at any time, without notice. To obtain a current version go to *www.bwbtechnologies.com.*.

Machine Introduction

Introduction
The BWB-1 Performance Plus is a multi-channel, low temperature Flame Photometer for the simultaneous measurement of Na, K, Li, Ca, and Ba in a variety of samples. It is designed for ease of use and reliable, trouble-free operation. With built-in air compressor, diagnostic indications, computer interface and control, automatic gas shut off, choice of Single Point or Multi-Point calibration and internal data handling the BWB-1 provides a simple, yet fully capable, instrument for the modern laboratory.

Summary of the Instrument
The BWB-1 employs a low temperature flame using air and propane, butane, or a combination of the two (as in LPG). Interference type filters are provided for Na, K, Li, Ca, and Ba. All these ions are monitored continuously and results shown on the digital display.

There are dual computer access points provided (RS232 and USB) that allow for interfacing to external software.

Diagnostic indications of several parameters are displayed on the front panel. Safety cut off of the gas supply is provided through constant monitoring of the flame. If the flame should go out for any reason, the gas will automatically stop flowing with a correspondent light on the panel and an audible signal alerting the user.

Embedded in the instrument enclosure is a built-in air compressor. A unique electronic control system automatically regulates the air pressure/flow to the optimum levels. No user adjustments are possible, or necessary, to achieve maximum performance. Provision for an external source of compressed air is included.

2. Health and Safety.

Warning!

The BWB-1 has parts of it that are connected to **High Voltages** that could cause serious injury if touched while the machine is connected to the Mains Supply! Please disconnect the machine from the supply and examine the Parts Removal drawings carefully before attempting to remove or replace any parts of this machine.

This machine has parts that carry pressurised Butane/Propane or LPG that can result in a **Fire Hazard** if the machine is incorrectly Repaired or Serviced. Please make sure the Gas supply is disconnected and the machine has been well ventilated by running the compressor on its own for several minutes.

The chimney assembly of the BWB-1 will get extremely **HOT** during use. Please wait until the unit has cooled down before carrying out any service or repair work.

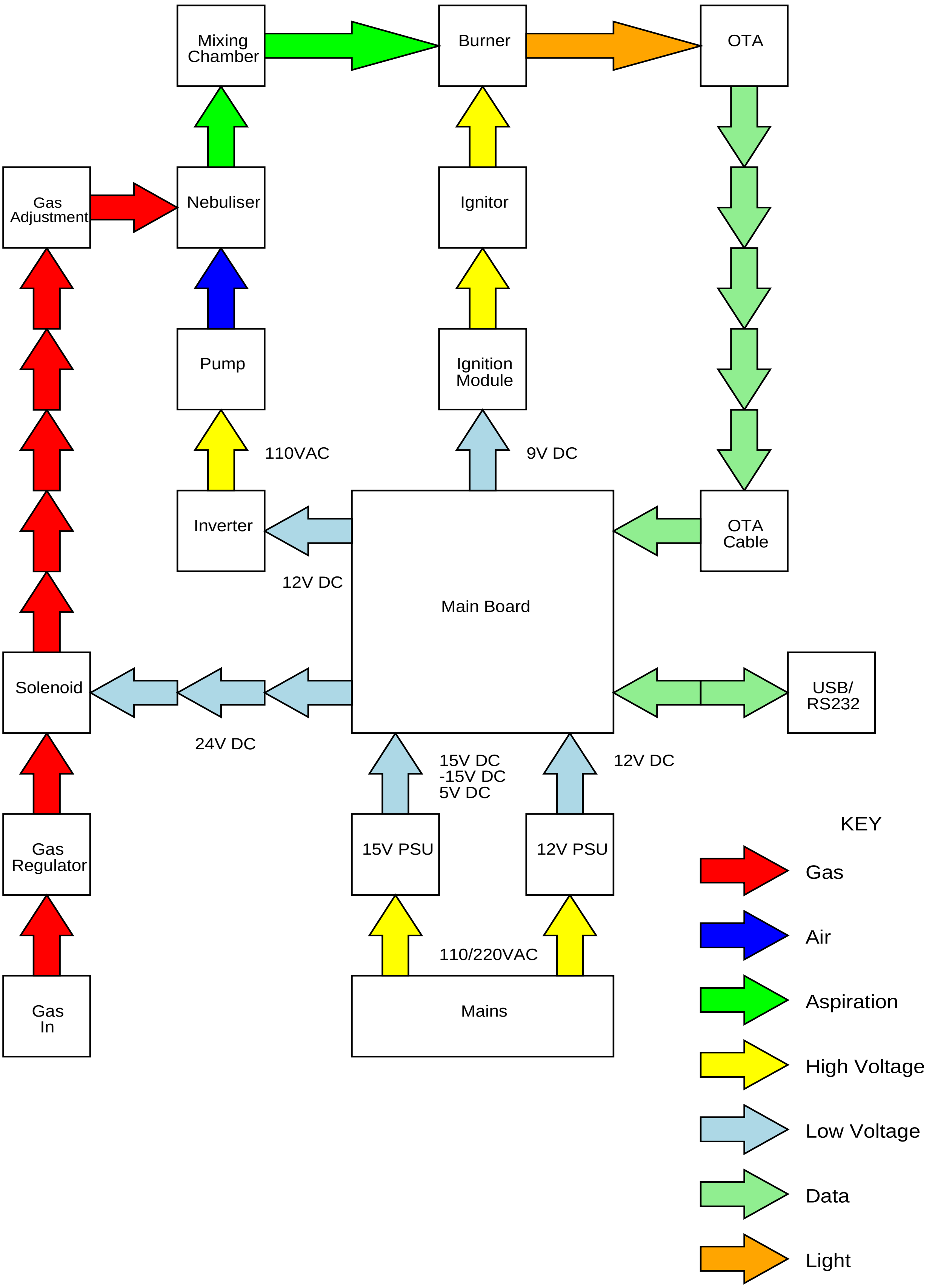
The LCD, Mainboard, OTA board and the RS232/USB board contain **Electrostatic Sensitive Devices** and suitable precautions should be taken when handling them.

The Nebuliser, Mixing Chamber and Burner assembly may have been exposed or contain chemical residue from Customer use. Suitable safety wear should be employed when handling these parts.

Any Maintenance or Repair to this machine must be carried out by a suitably Qualified or Trained person.

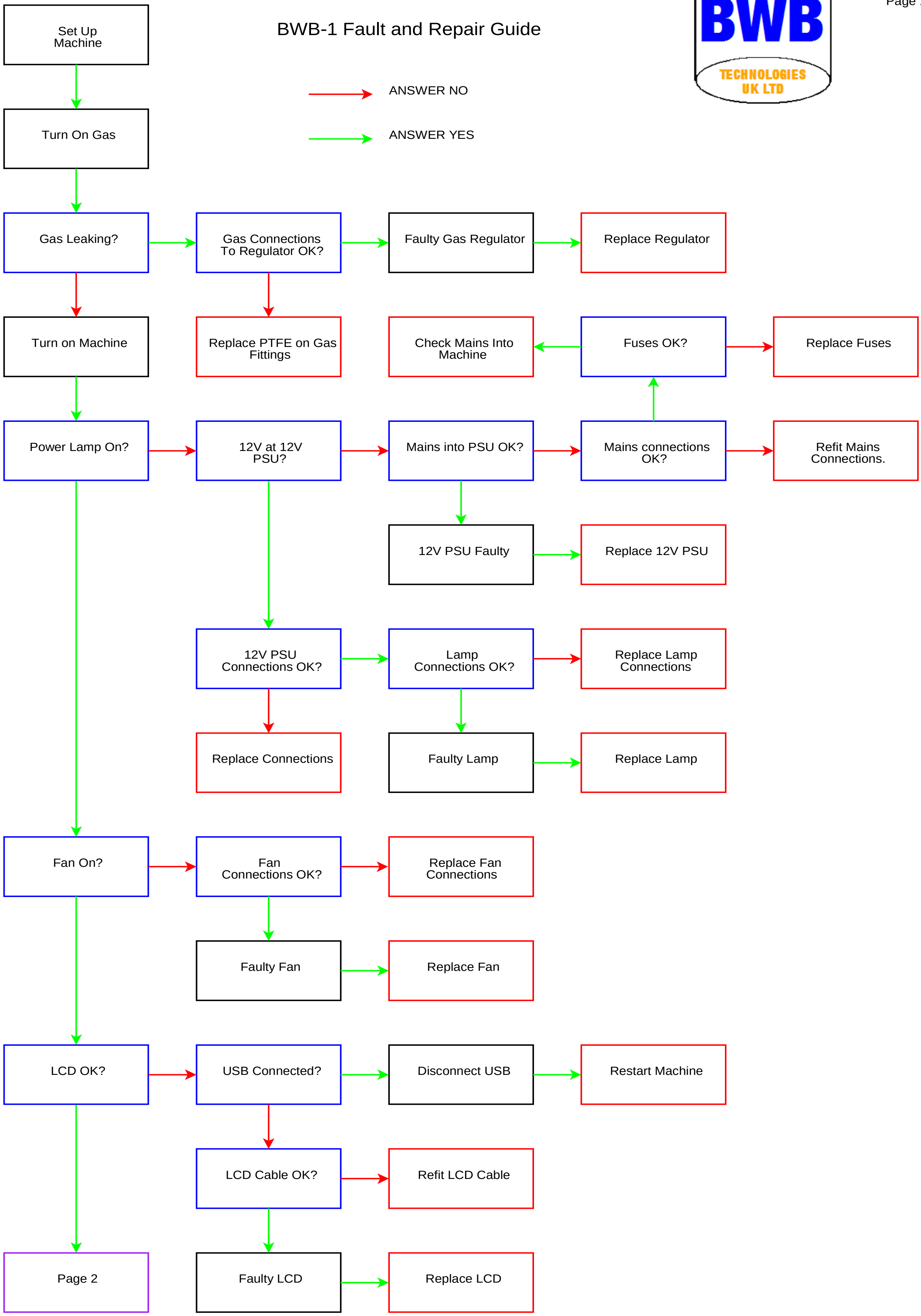
All removed parts should be disposed of in the correct manner or returned to BWB UK for disposal or recycling.

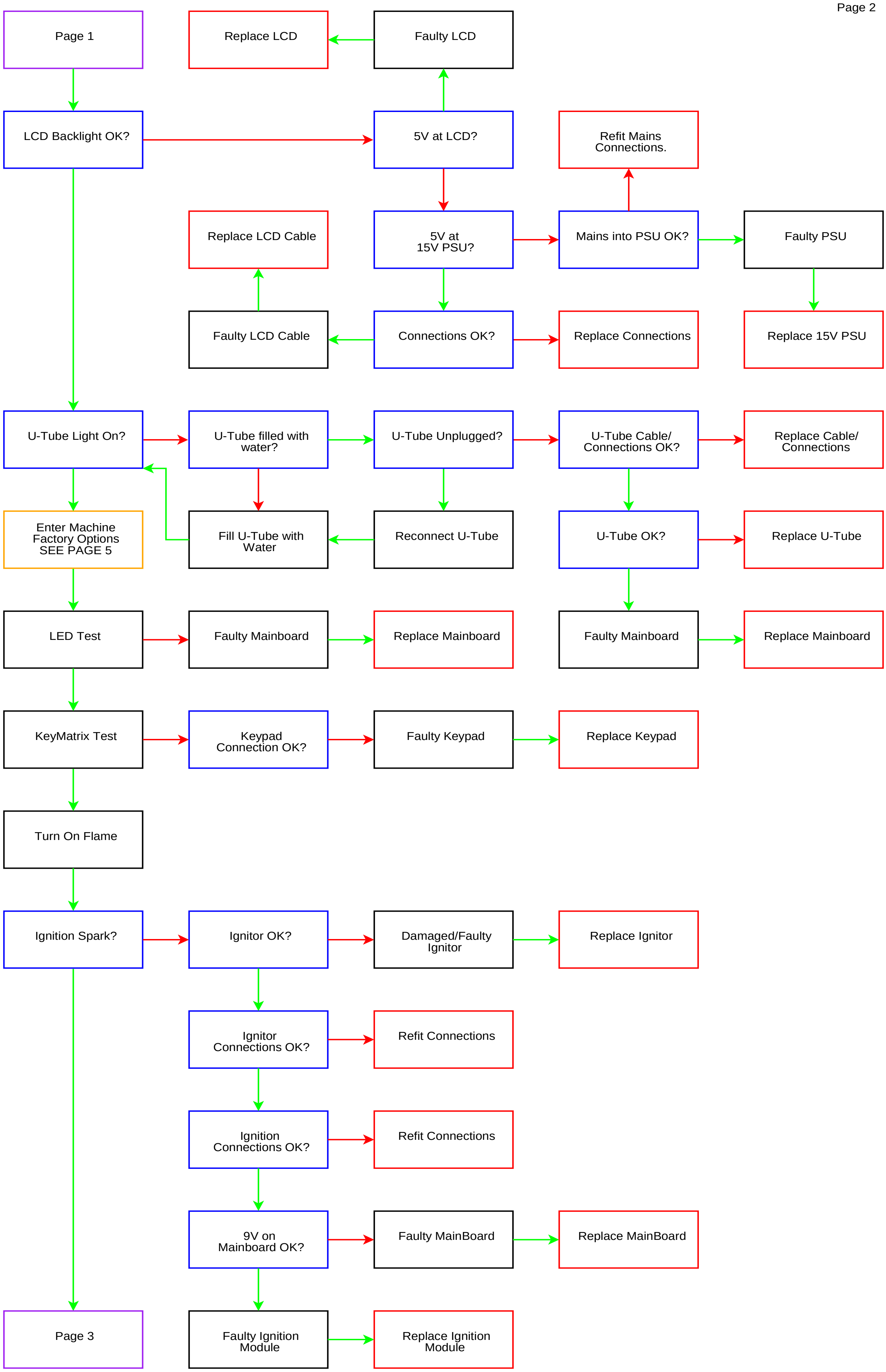
BWB-1 Parts Interconnect

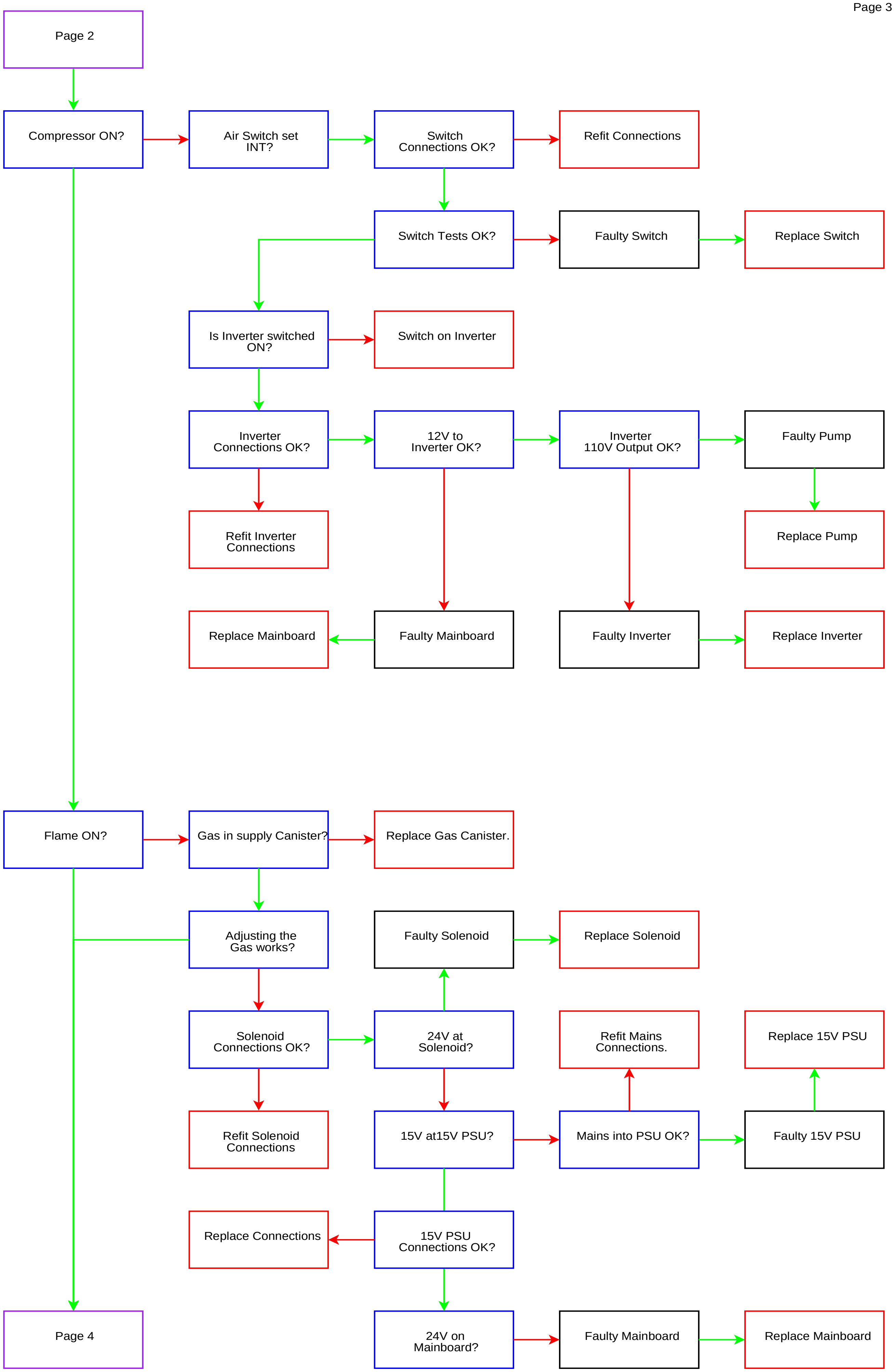


BWB-1 SERVICE AND REPAIR.
SECTION 4.
FAULT GUIDE.

BWB-1 Fault and Repair Guide

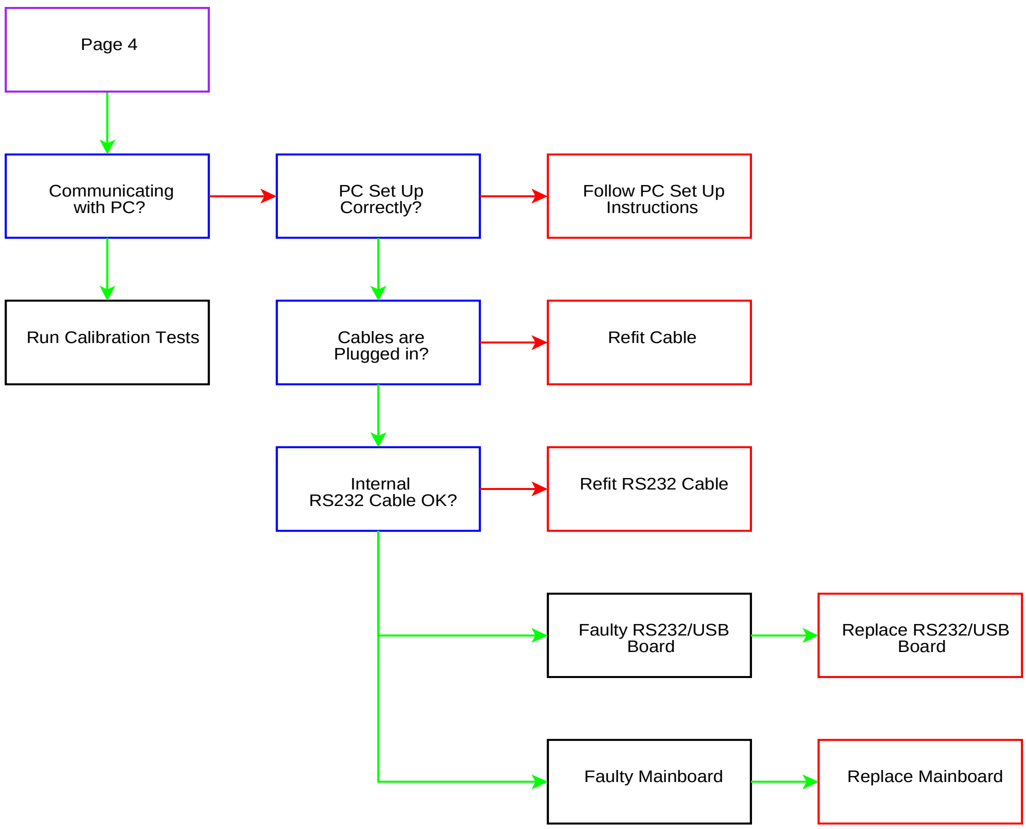



Page 1
Replace LCD
Faulty LCD
LCD Backlight OK?
5V at LCD?
Refit Mains Connections.
Replace LCD Cable
5V at 15V PSU?
Mains into PSU OK?
Faulty PSU
Faulty LCD Cable
Connections OK?
Replace Connections
Replace 15V PSU
U-Tube Light On?
U-Tube filled with water?
U-Tube Unplugged?
U-Tube Cable/ Connections OK?
Replace Cable/ Connections
Enter Machine Factory Options SEE PAGE 5
Fill U-Tube with Water
Reconnect U-Tube
U-Tube OK?
Replace U-Tube
LED Test
Faulty Mainboard
Replace Mainboard
Faulty Mainboard
Replace Mainboard
KeyMatrix Test
Keypad Connection OK?
Faulty Keypad
Replace Keypad
Turn On Flame
Ignition Spark?
Ignitor OK?
Damaged/Faulty Ignitor
Replace Ignitor
Ignitor Connections OK?
Refit Connections
Ignition Connections OK?
Refit Connections
9V on Mainboard OK?
Faulty MainBoard
Replace MainBoard
Page 3
Faulty Ignition Module
Replace Ignition Module

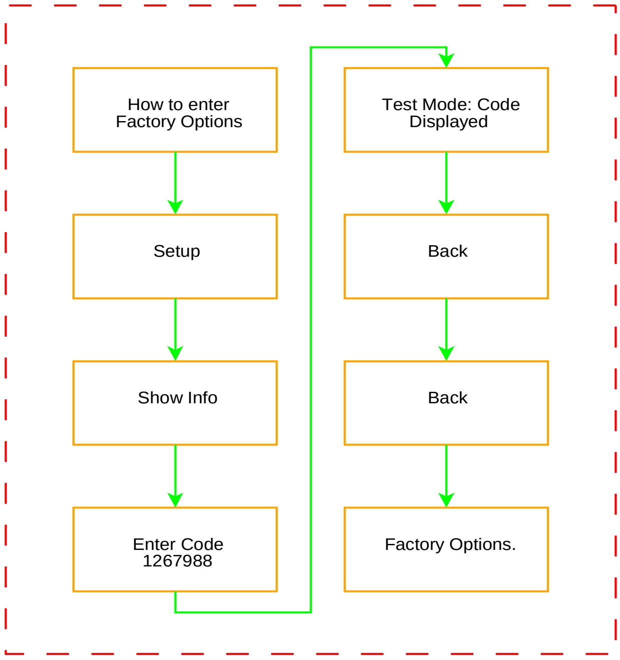

Page 2
Compressor ON?
Air Switch set INT?
Switch Connections OK?
Refit Connections
Switch Tests OK?
Faulty Switch
Replace Switch
Is Inverter switched ON?
Switch on Inverter
Inverter Connections OK?
12V to Inverter OK?
Inverter 110V Output OK?
Faulty Pump
Refit Inverter Connections
Replace Pump
Replace Mainboard
Faulty Mainboard
Faulty Inverter
Replace Inverter
Flame ON?
Gas in supply Canister?
Replace Gas Canister.
Adjusting the Gas works?
Faulty Solenoid
Replace Solenoid
Solenoid Connections OK?
24V at Solenoid?
Refit Mains Connections.
Replace 15V PSU
Refit Solenoid Connections
15V at15V PSU?
Mains into PSU OK?
Faulty 15V PSU
Replace Connections
15V PSU Connections OK?
Page 4
24V on Mainboard?
Faulty Mainboard
Replace Mainboard



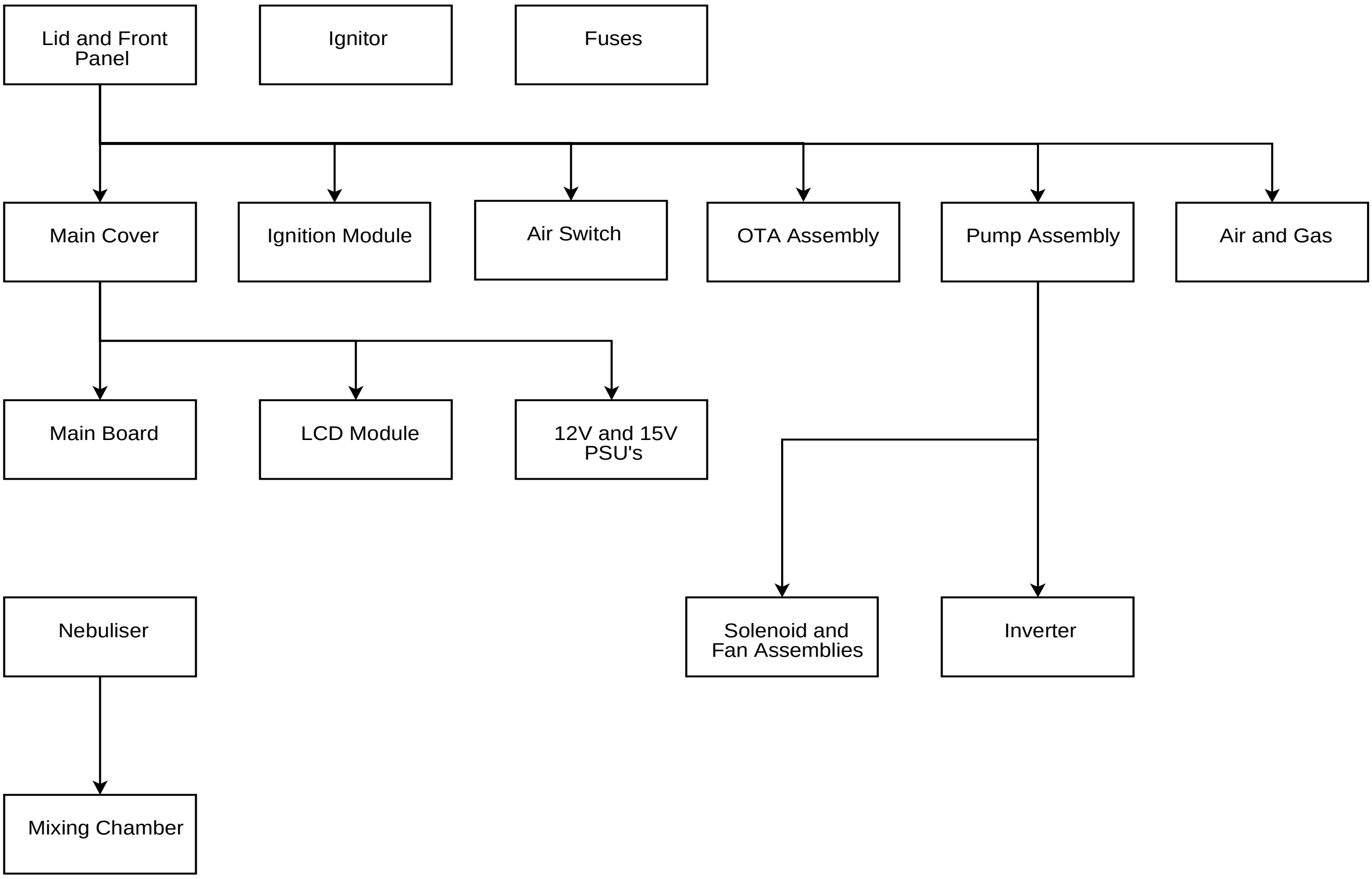
Page 3
Flame Goes out / Flame Out Lamp ON?
OTA Cable OK?
Faulty OTA Cable
Replace OTA Cable
OTA Cable Connected?
Faulty OTA
Replace OTA
Refit OTA Cable
Faulty Mainboard
Replace Mainboard
Unstable Flame?
Adjust Gas Stabilizes Flame?
Nebuliser Clean?
Clean Nebuliser
Aspirating?
Airlock in Aspiration Tube?
Clean out Aspiration Tube
Faulty Nebuliser
Replace Nebuliser
Blocked Needle
Clean out Needle
Machine warmed up?
Wait for Machine To Stabilise
Read Mode
Unstable Readings
Adjust Flame Solves Problem?
Spray from Nebuliser OK?
Nebuliser Clean?
Clean Nebuliser
Faulty Nebuliser
Replace Nebuliser
Stable Readings
Faulty OTA
Replace OTA
Page 5
Faulty Mainboard
Replace Mainboard



FACTORY OPTIONS.

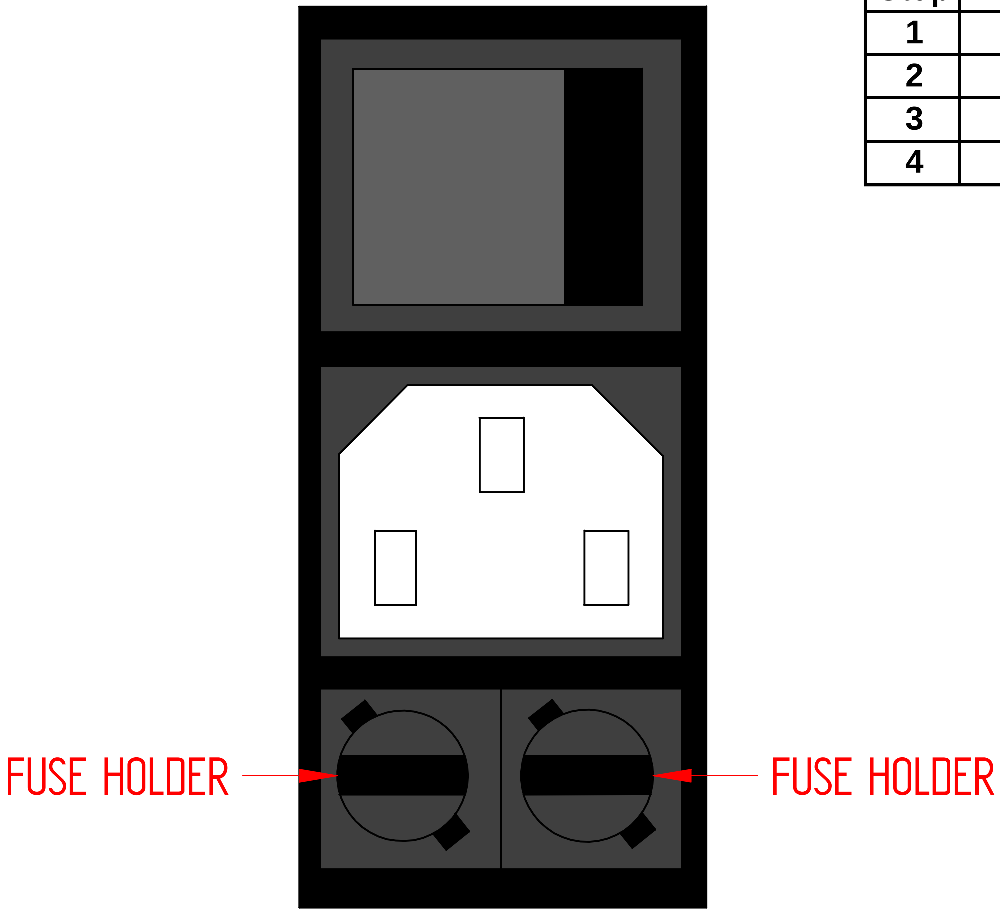


BWB-1 SERVICE AND REPAIR.
SECTION 5.
PARTS REMOVAL DIAGRAMS.


Lid and Front Panel
Ignitor
Fuses
Main Cover
Ignition Module
Air Switch
OTA Assembly
Pump Assembly
Air and Gas
Main Board
LCD Module
12V and 15V PSU's
Nebuliser
Solenoid and Fan Assemblies
Inverter
Mixing Chamber

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

Step	Instruction
1	Undo Fuse Holders
2	Remove Fuses from Holders
3	Fit new Fuses
4	Replace Fuse Holders



	NAME	DATE
DRAWN	JNG	09/18/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

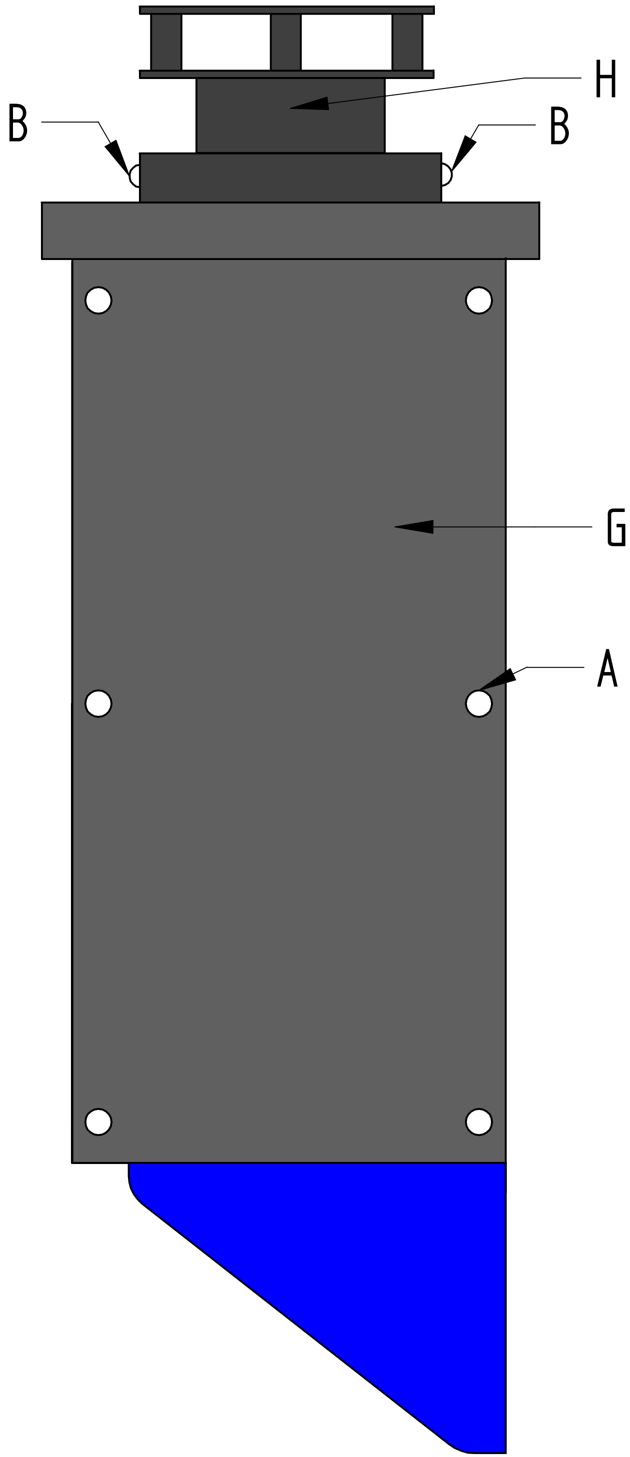
TITLE
BWB Fuse removal

SIZE A2 | DWG NO BWBSM0014 | REV 1.0

FILE NAME: BWBservicefuses.dft

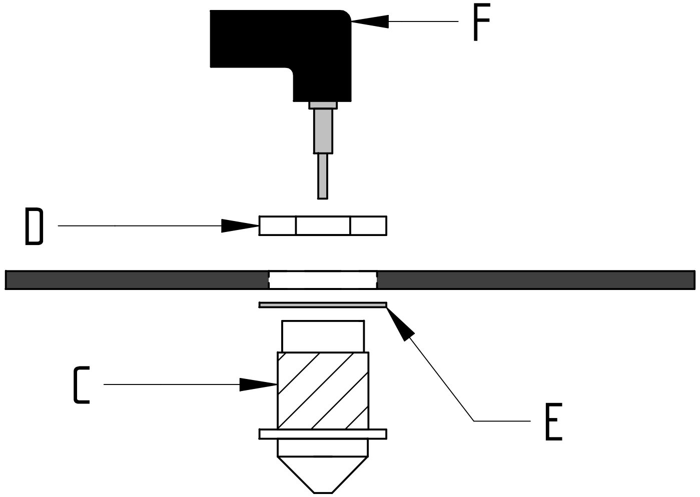
SCALE: | WEIGHT: | SHEET 1 OF 1

REV	DESCRIPTION	DATE	APPROVED



Chimney Rear View.

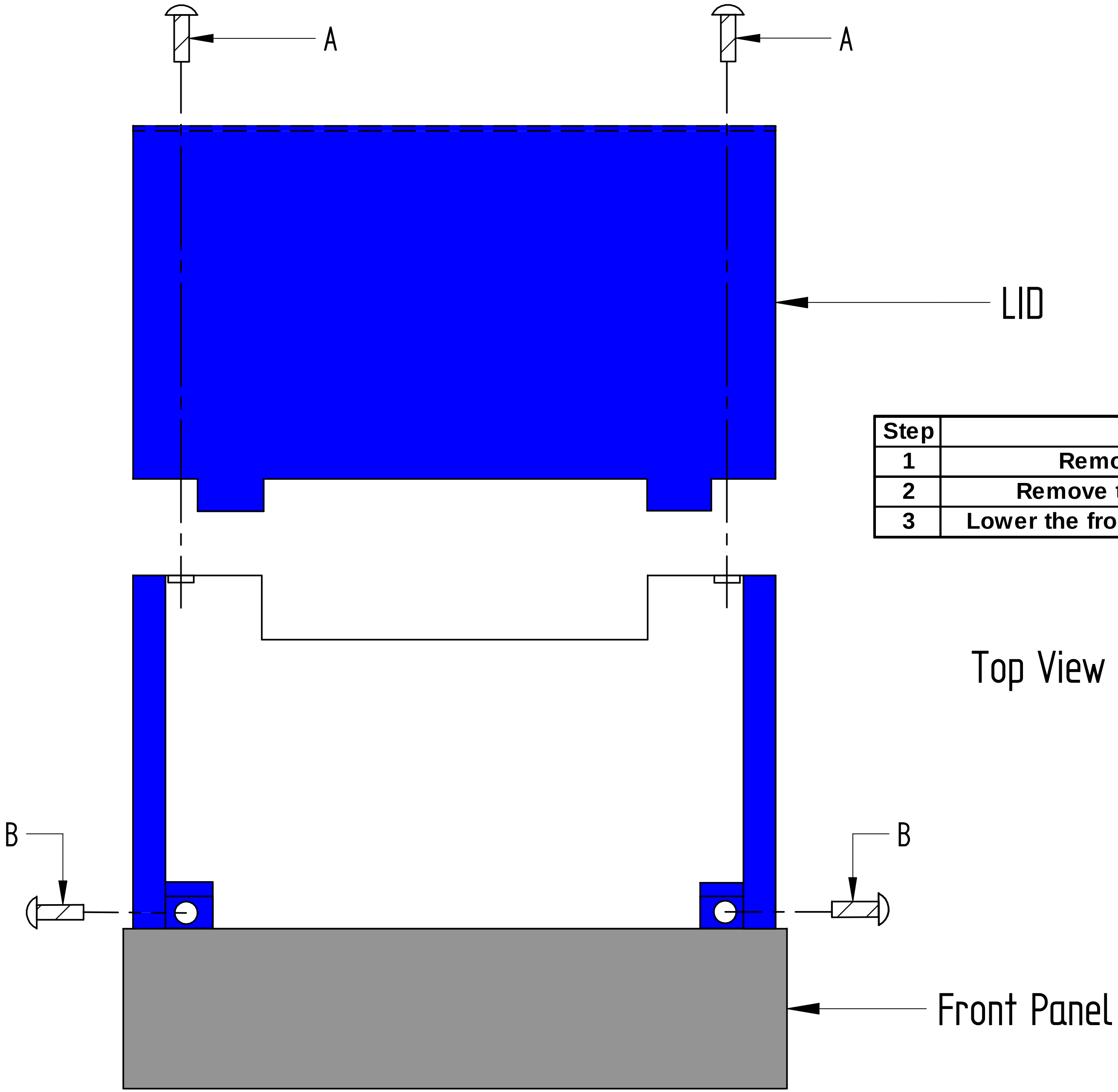
Step	Instruction
1	Remove the 6x M4 Screws(A) from the Rear Panel(G)
2	Pull back the Rubber Boot (F) and undo the screw from the Electrode of the Ignitor(C)
3	Remove the 2x M3 Screws(B) from the Inner Chimney(H)
4	Lift out the Inner Chimney(H)
5	Undo the Ignitor Nut(D) and remove the Ignitor(C).



	NAME	DATE	BWB-1
DRAWN	JNG	09/23/08	TITLE Ignitor Removal
CHECKED			SIZE A2 DWG NO BWBSM0013 REV 1.0
ENG APPR			FILE NAME: BWBserviceIgnitor.dft
MGR APPR			SCALE: WEIGHT: SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS ANGLES ±X.X° 2 PL ±X.XX 3 PL ±X.XXX

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

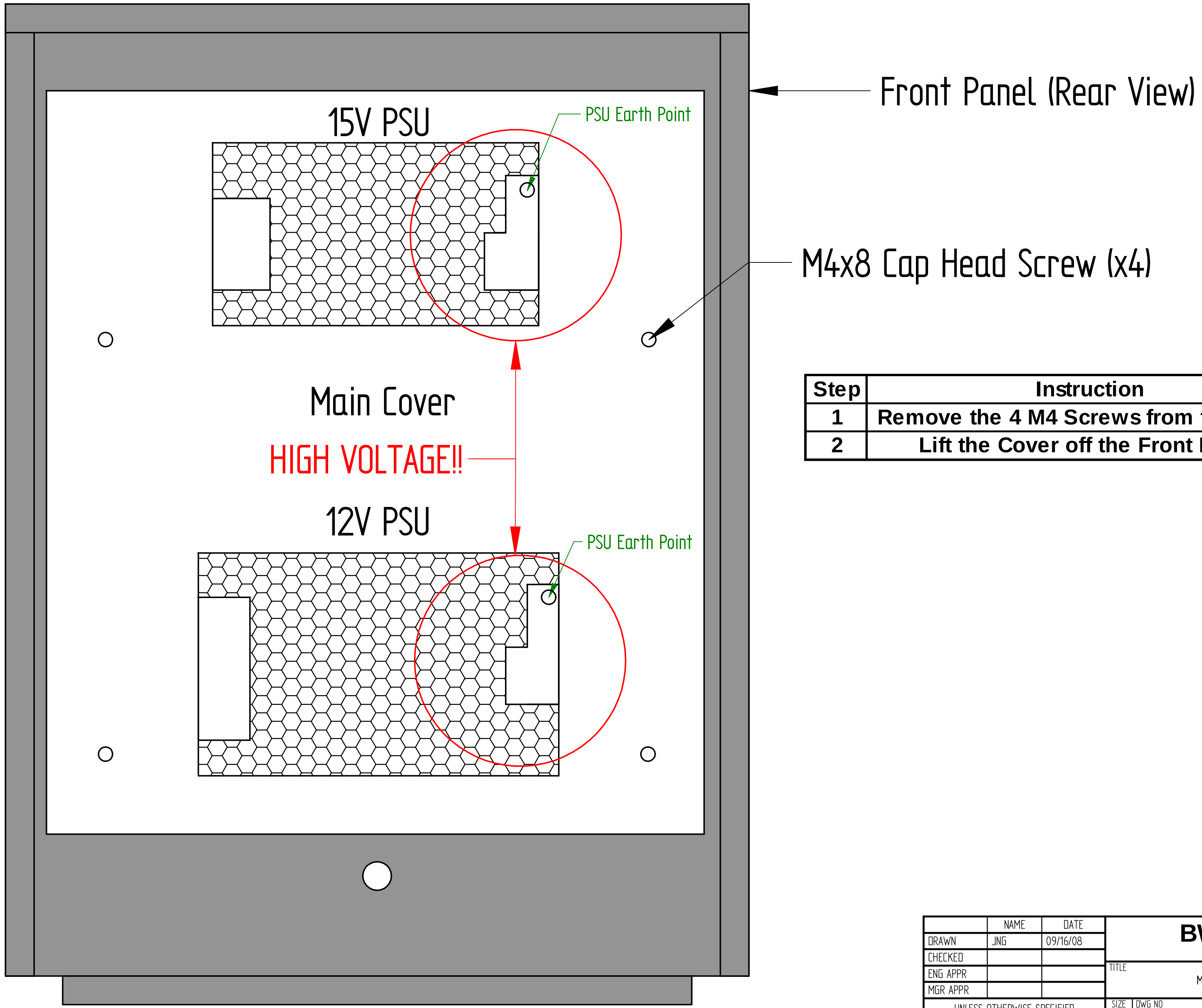


Step	Instruction
1	Remove the screws (A) from the Lid
2	Remove the screws (B) from the front panel
3	Lower the front panel to gain access to the internals

Top View Of BWB-1

	NAME	DATE	BWB-1		
DRAWN	JNG	09/11/08	TITLE LID removal		
CHECKED					
ENG APPR					
MGR APPR					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS ANGLES ±X.X° 2 PL ±X.XX 3 PL ±X.XXX			SIZE A2	DWG NO BWBSM0001	REV 1.0
			FILE NAME: BWBservicelid.dft		
			SCALE:	WEIGHT:	SHEET 1 OF 1

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED



Step	Instruction
1	Remove the 4 M4 Screws from the Cover
2	Lift the Cover off the Front Panel

	NAME	DATE
DRAWN	JNG	09/16/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

TITLE: Main Cover

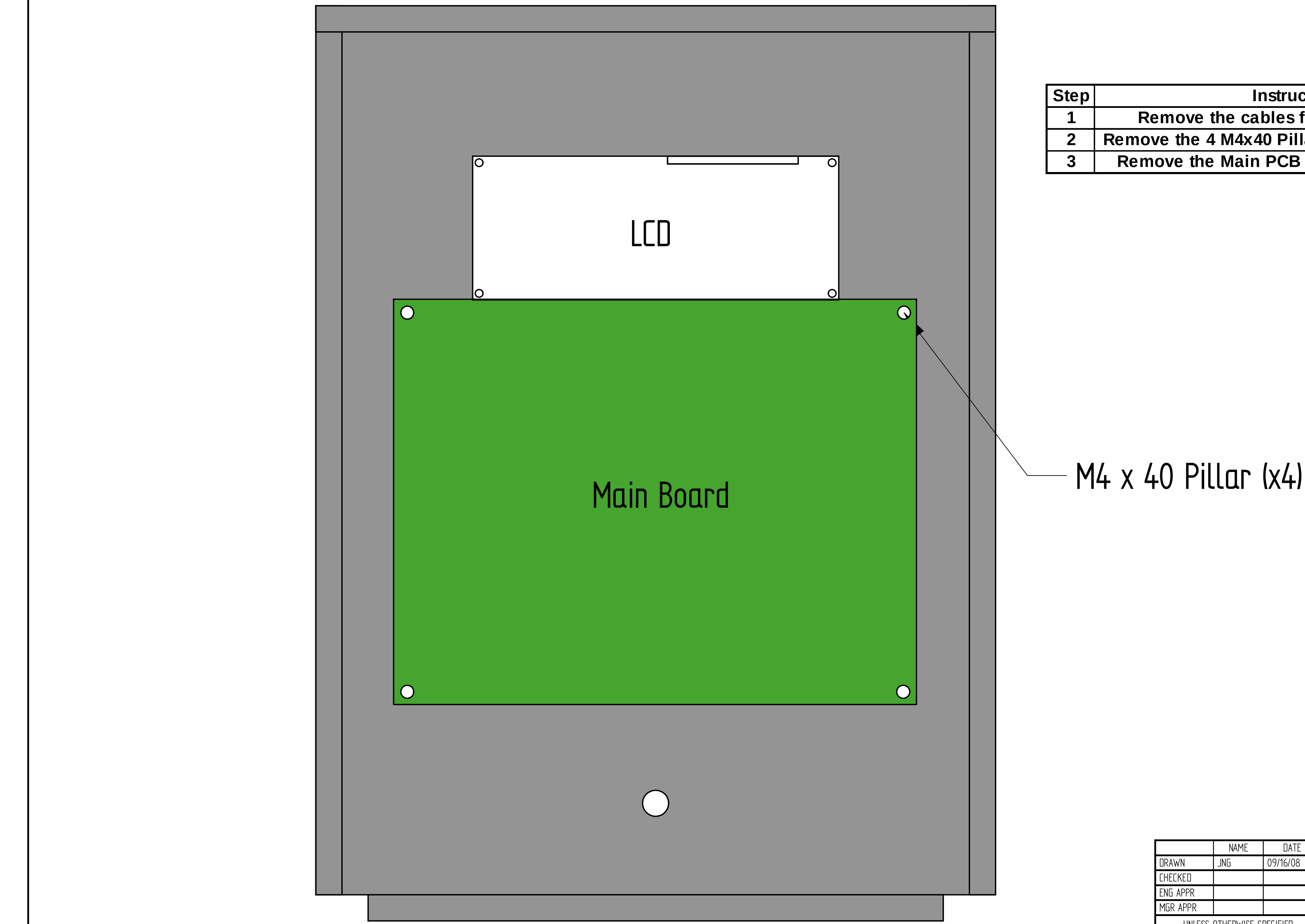
SIZE: A2 | DWG NO: BWBSM00** | REV: 1.0

FILE NAME: BWBserviceMainCover.dft

SCALE: | WEIGHT: | SHEET 1 OF 1

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

Front Panel (Rear View)



Step	Instruction
1	Remove the cables from the Main PCB
2	Remove the 4 M4x40 Pillars from the Main PCB
3	Remove the Main PCB from the Front Panel

	NAME	DATE
DRAWN	JNG	09/16/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

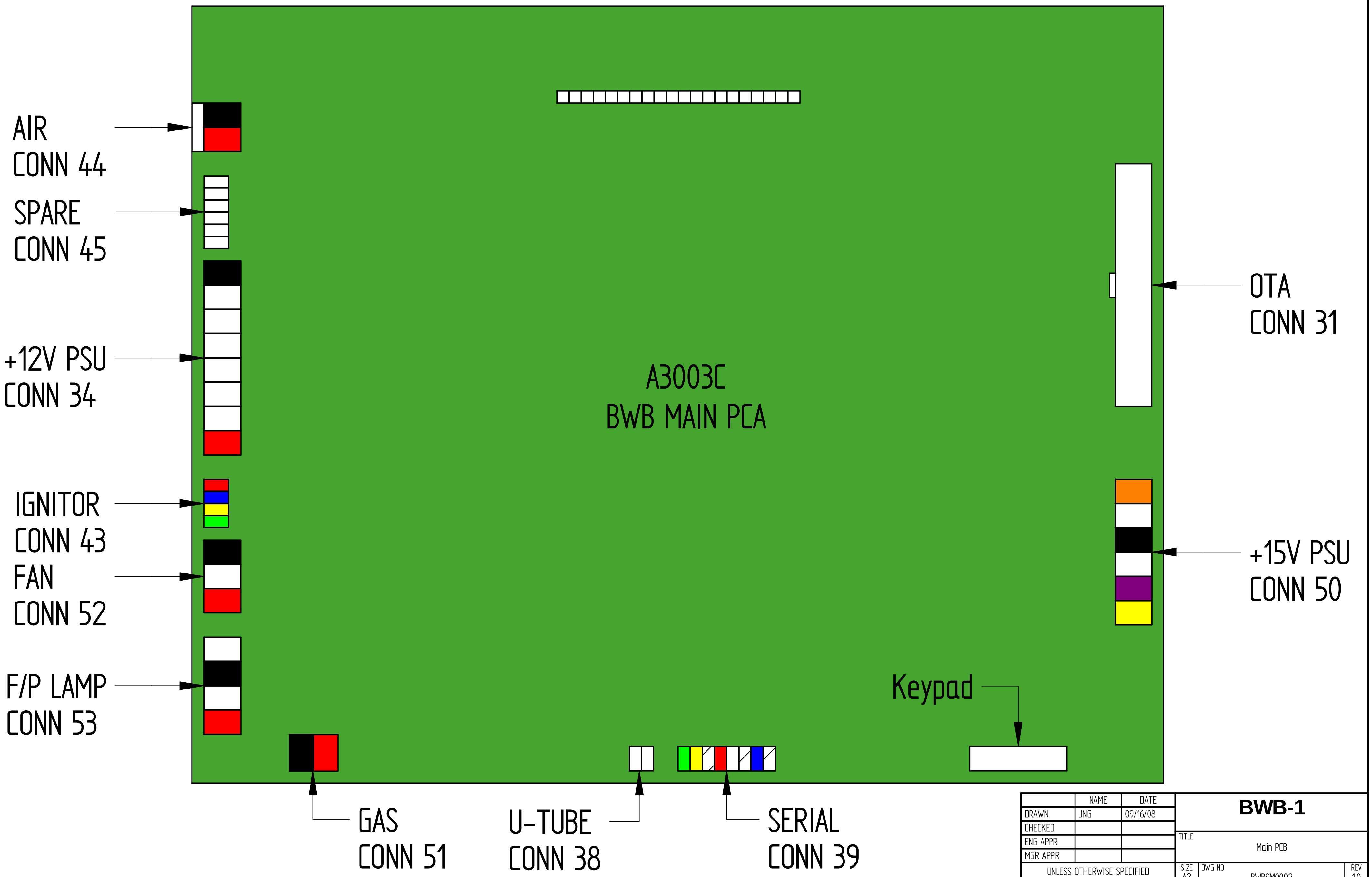
TITLE
Main PCB

SIZE	DWG NO	REV
A2	BWBSM0002	1.0

FILE NAME: BWBserviceMainPCB.dft

SCALE: | WEIGHT: | SHEET 1 OF 3

Main Board Connectors



REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

	NAME	DATE
DRAWN	JNG	09/16/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

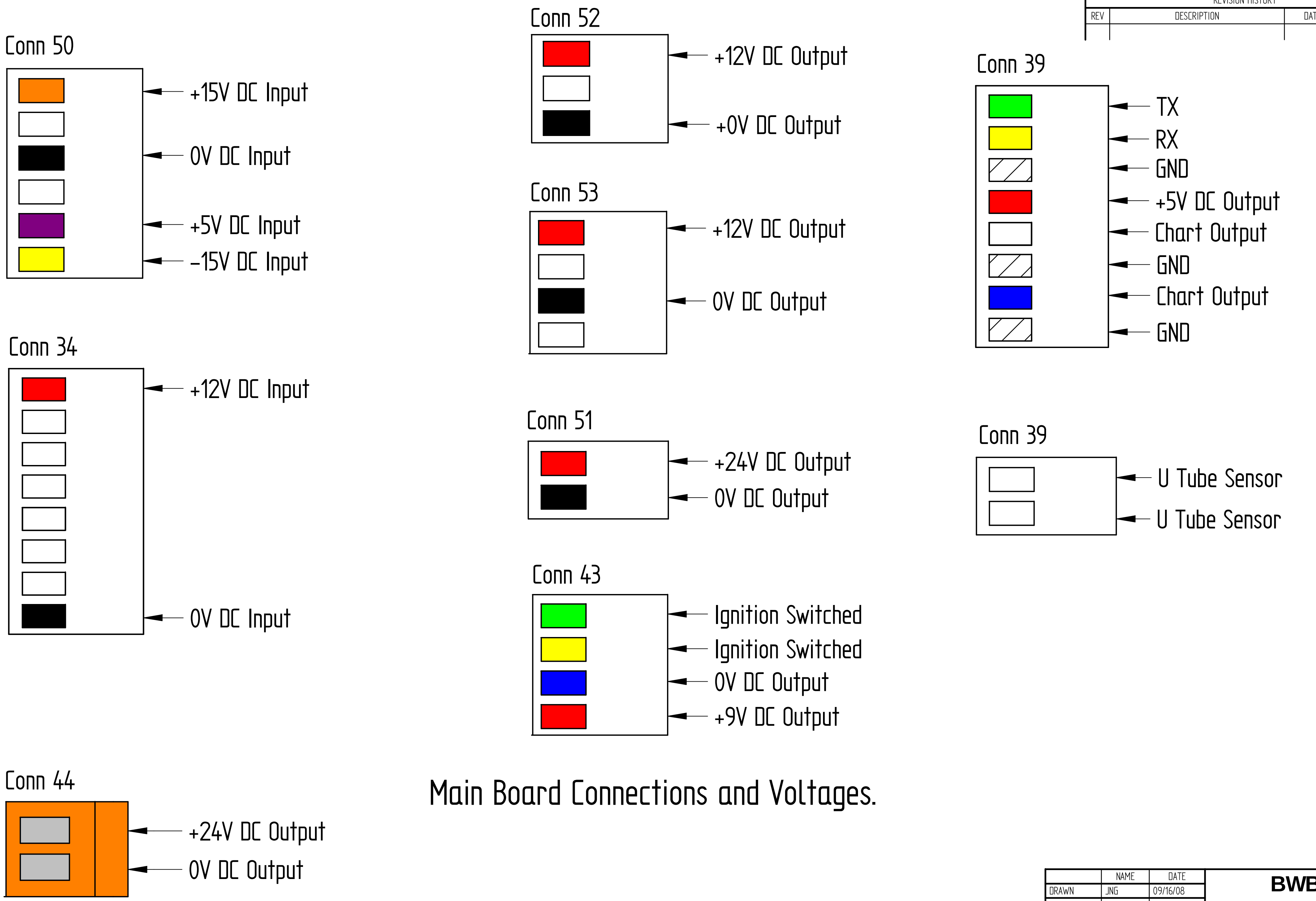
TITLE: Main PCB

SIZE: A2 | DWG NO: BWBSM0002 | REV: 1.0

FILE NAME: BWBserviceMainPCB.dft

SCALE: | WEIGHT: | SHEET 2 OF 3

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED



Main Board Connections and Voltages.

	NAME	DATE
DRAWN	JNG	09/16/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

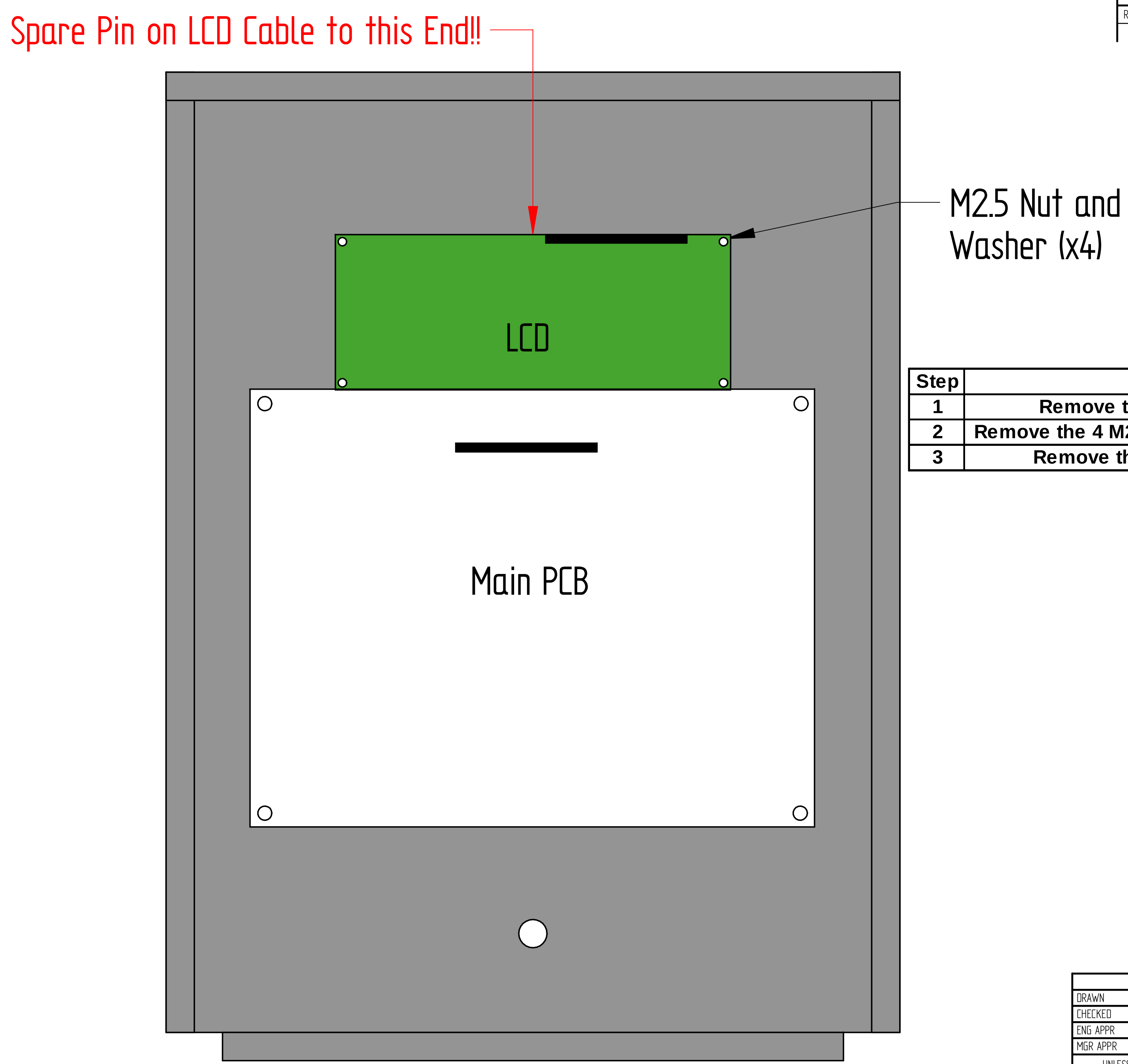
TITLE: Main PCB

SIZE: A2 | DWG NO: BWBSM0002 | REV: 1.0

FILE NAME: BWBserviceMainPCB.dft

SCALE: | WEIGHT: | SHEET 3 OF 3

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED



Step	Instruction
1	Remove the LCD Cable from the LCD.
2	Remove the 4 M2.5 Nuts and washers from the LCD.
3	Remove the LCD from the Front Panel.

	NAME	DATE
DRAWN	JNG	09/16/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

TITLE: LCD Removal

SIZE	DWG NO	REV
A2	BWBSM0004	1.0

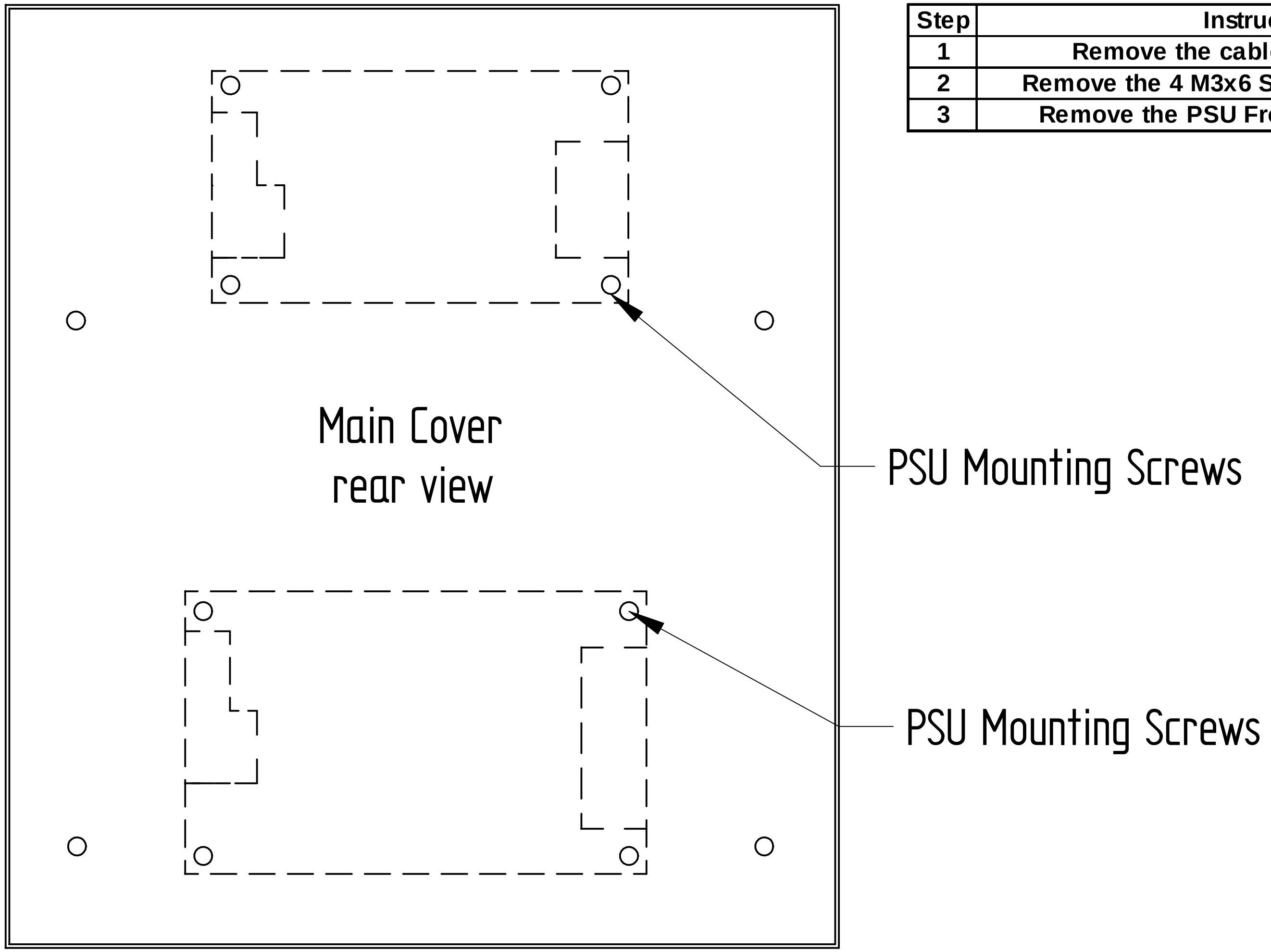
FILE NAME: BWBserviceLCD.dft

SCALE:	WEIGHT:	SHEET 1 OF 1

REV	DESCRIPTION	DATE	APPROVED

REVISION HISTORY

Step	Instruction
1	Remove the cables from the PSU
2	Remove the 4 M3x6 Screws from the PSU
3	Remove the PSU From the Main Cover



	NAME	DATE
DRAWN	JNG	09/16/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

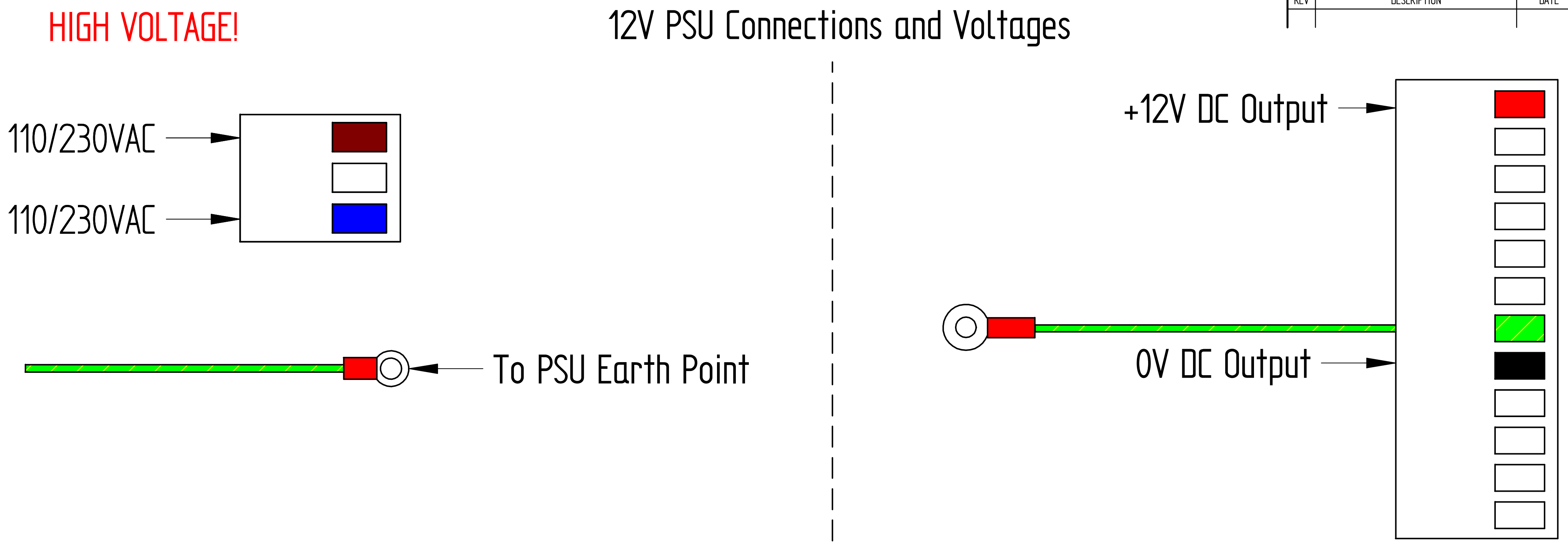
TITLE PSU

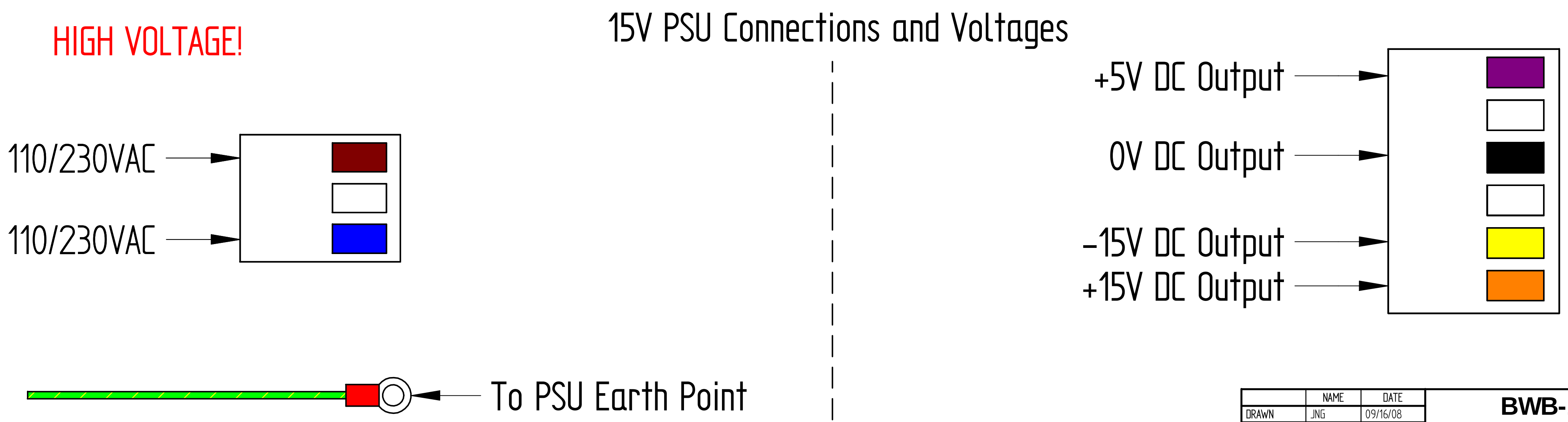
SIZE A2 | DWG NO BWBSM0005 | REV 1.0

FILE NAME: BWBservicePSU.dft

SCALE: | WEIGHT: | SHEET 1 OF 2

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED





	NAME	DATE
DRAWN	JNG	09/16/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

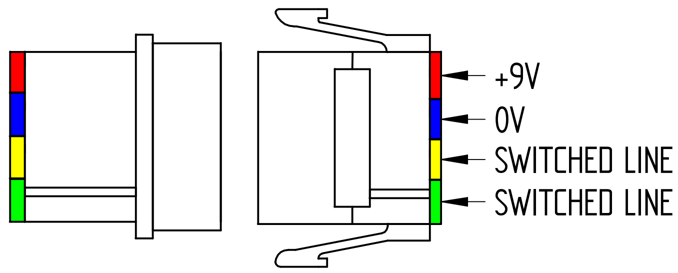
TITLE: PSU

SIZE	DWG NO	REV
A2	BWBSM0005	1.0

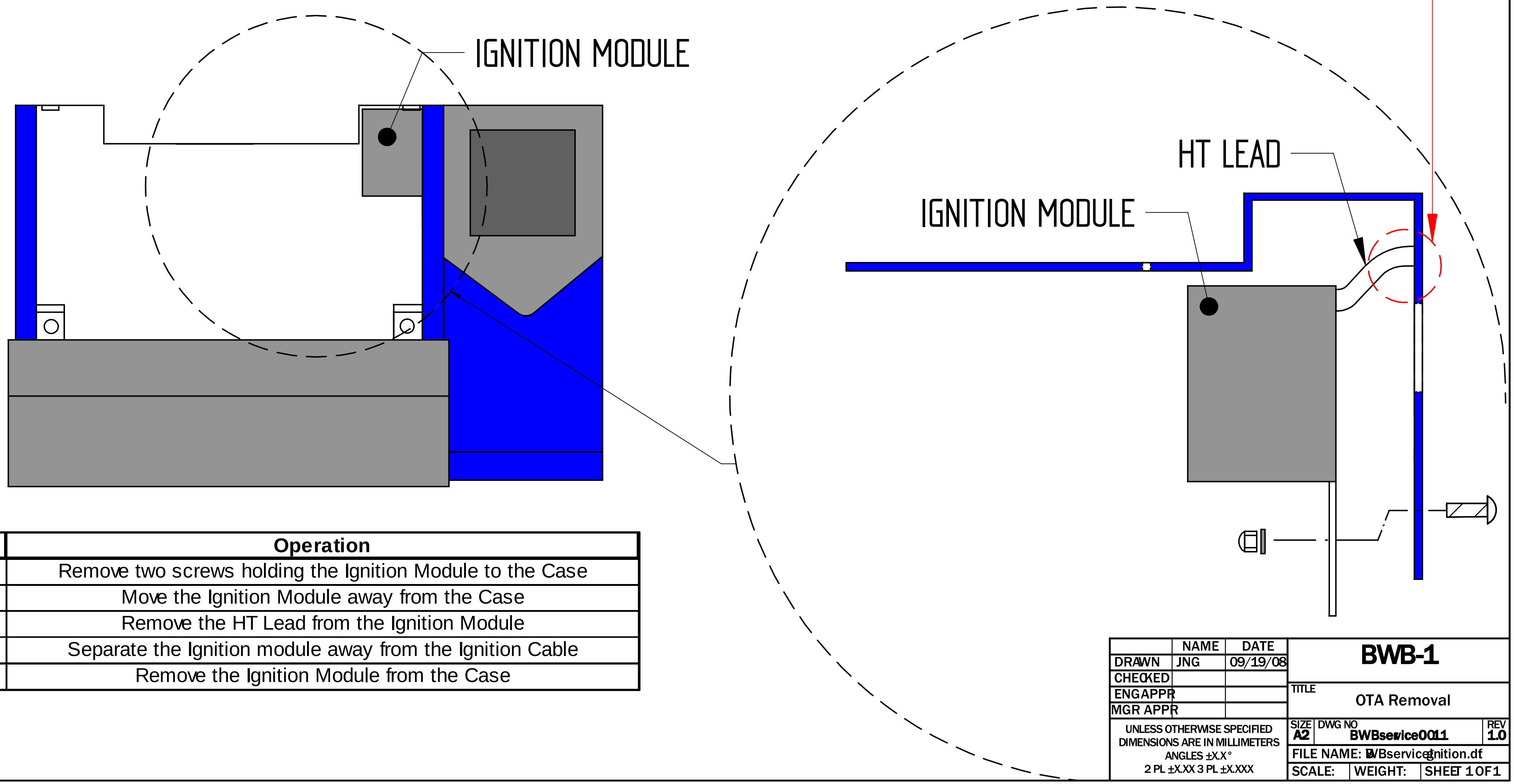
FILE NAME: BWBservicePSU.dft

SCALE: | WEIGHT: | SHEET 2 OF 2

Ignition Module removal.



Top View Of Flame Photometer



Step	Operation
1	Remove two screws holding the Ignition Module to the Case
2	Move the Ignition Module away from the Case
3	Remove the HT Lead from the Ignition Module
4	Separate the Ignition module away from the Ignition Cable
5	Remove the Ignition Module from the Case

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

	NAME	DATE
DRAWN	JNG	09/19/08
CHECKED		
ENGAPPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS ANGLES ±X.X° 2 PL ±X.XX 3 PL ±X.XXX

BWB-1

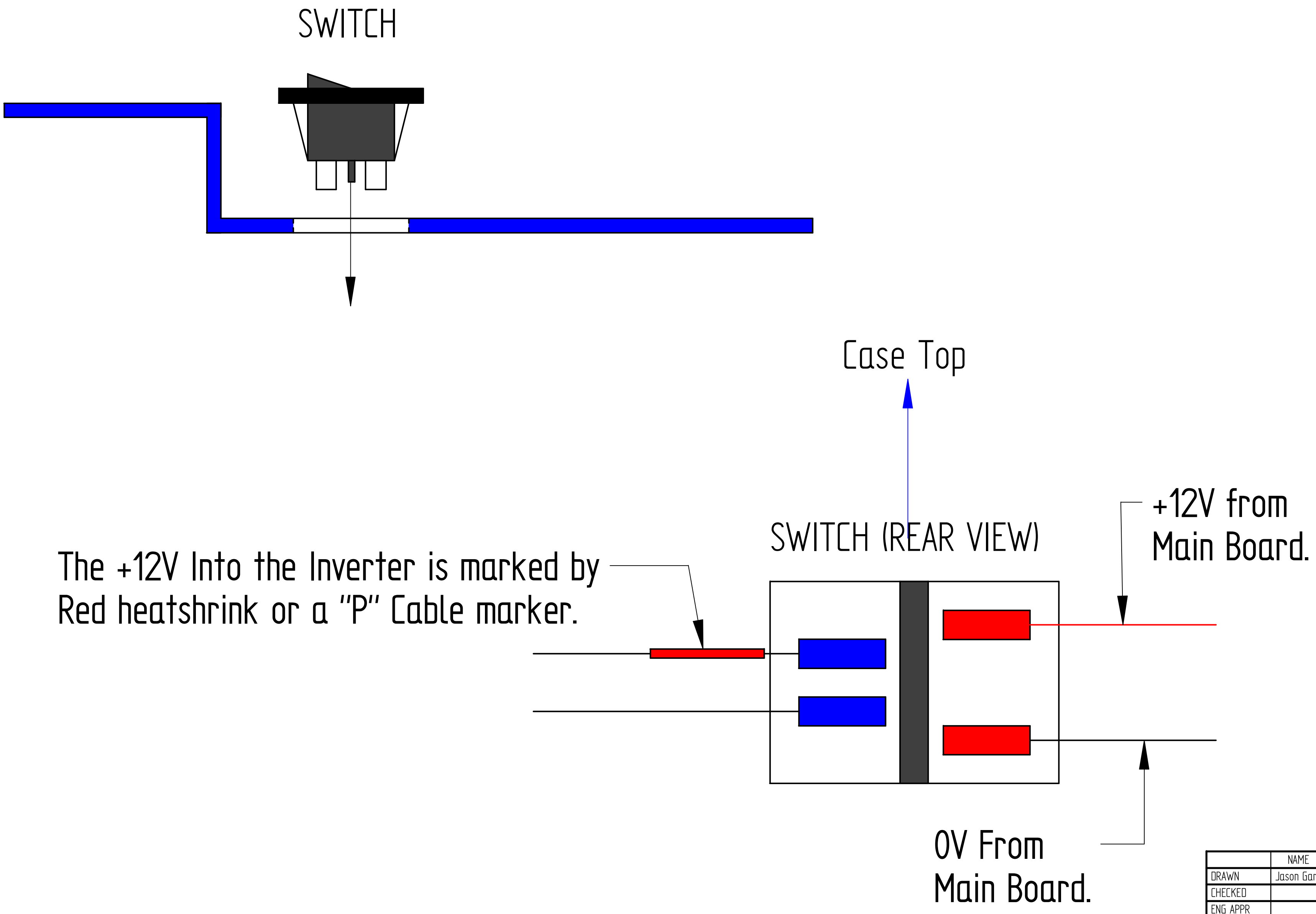
TITLE OTA Removal

SIZE A2 | DWG NO BWBservice0011 | REV 1.0

FILE NAME: BWBserviceIgnition.dft

SCALE: | WEIGHT: | SHEET 1 OF 1

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED



	NAME	DATE
DRAWN	Jason Garnham	09/18/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

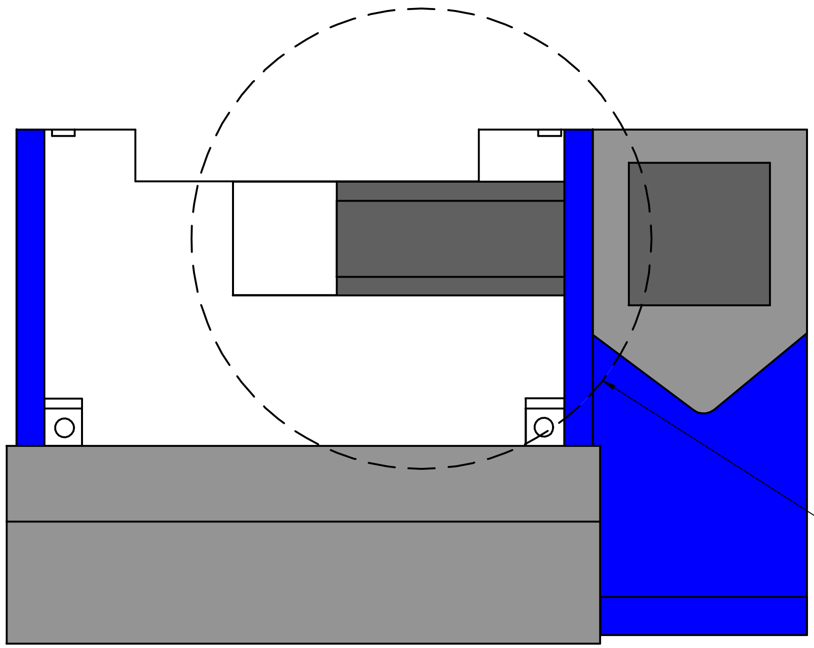
BWB-1

TITLE: Air Switch		
SIZE: A2	DWG NO: BWBSM0010	REV: 1.0
FILE NAME: BWBserviceAirSW.dft		
SCALE:	WEIGHT:	SHEET 1 OF 1

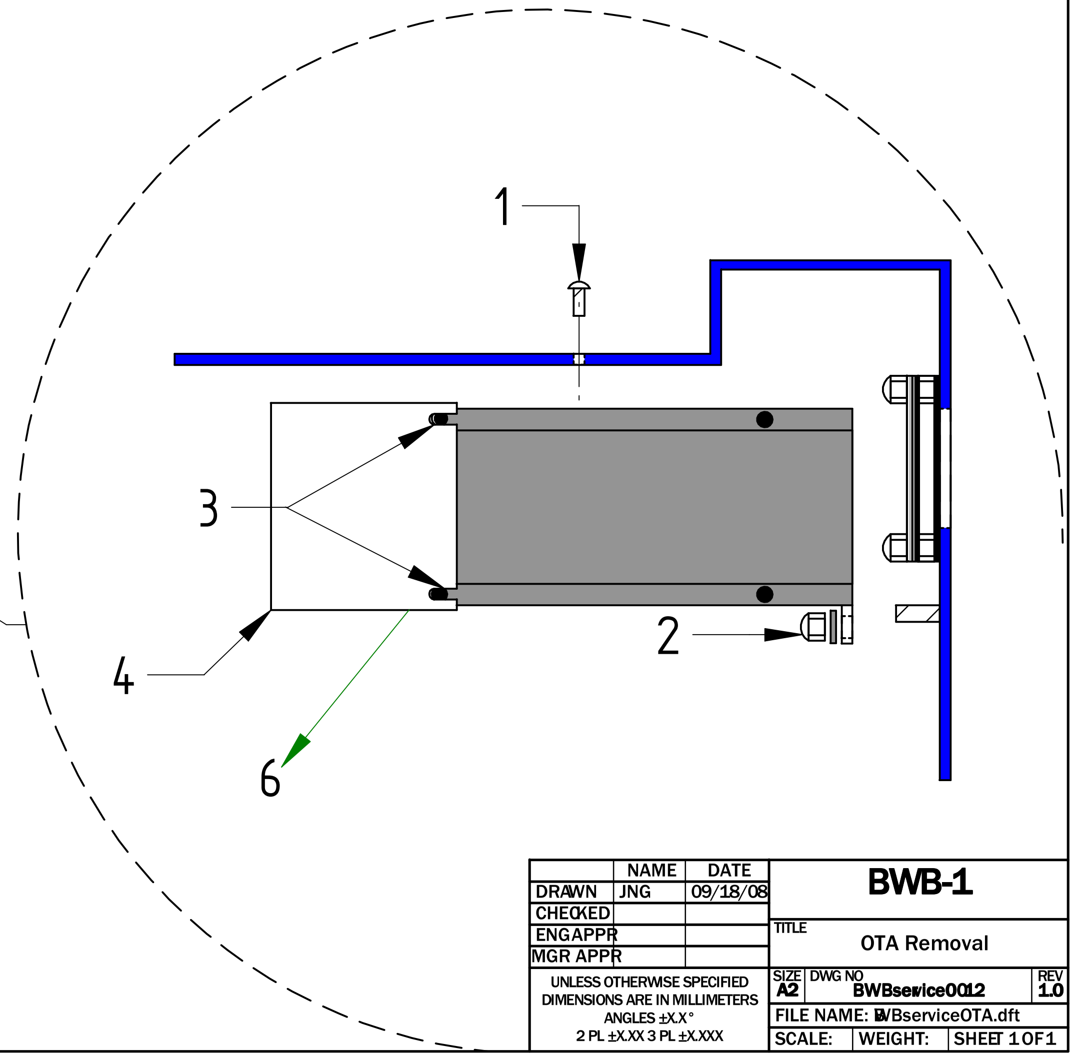
OTA Assembly removal.

Step	Action
1	Remove the rear screw from holding the OTA to the Case.
2	Remove the Nyloc and washer from the retaining stud.
3	Remove the two screws holding the OTA Shield in place.
4	Remove the OTA Shield.
5	Unplug the OTA Cable
6	Remove the OTA Assembly from the case.

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED



Top View Of Flame Photometer



	NAME	DATE
DRAWN	JNG	09/18/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

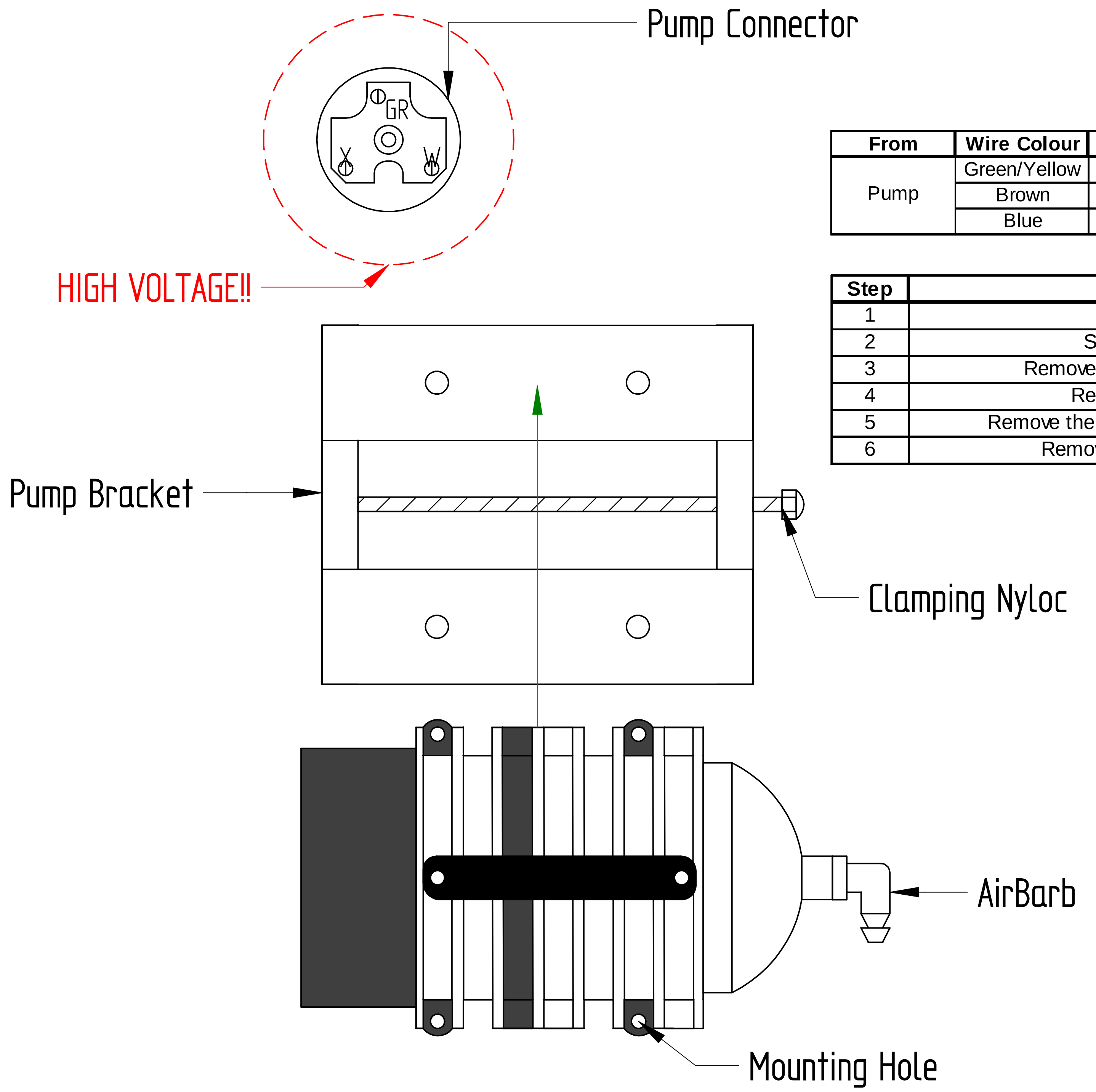
BWB-1

TITLE
OTA Removal

SIZE A2 | DWG NO BWBservice0012 | REV 1.0

FILE NAME: BWBserviceOTA.dft

SCALE: | WEIGHT: | SHEET 1 OF 1



From	Wire Colour	Alt Colour	Pin	To
Pump	Green/Yellow	Green	GR	Y5141 3 Pin US Connector
	Brown	Black	X	
	Blue	White	W	

Step	Operation
1	Loosen the Clamping Nyloc
2	Slide the Pump Bracket fowards.
3	Remove the Pump Connector from the Inverter
4	Remove the Airline from the AirBarb
5	Remove the 4 screws from the Pump Mounting Points
6	Remove the Pump from the Pump Bracket

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

	NAME	DATE
DRAWN	JNG	09/20/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS ANGLES ±X.X° 2 PL ±X.XX 3 PL ±X.XXX

BWB-1

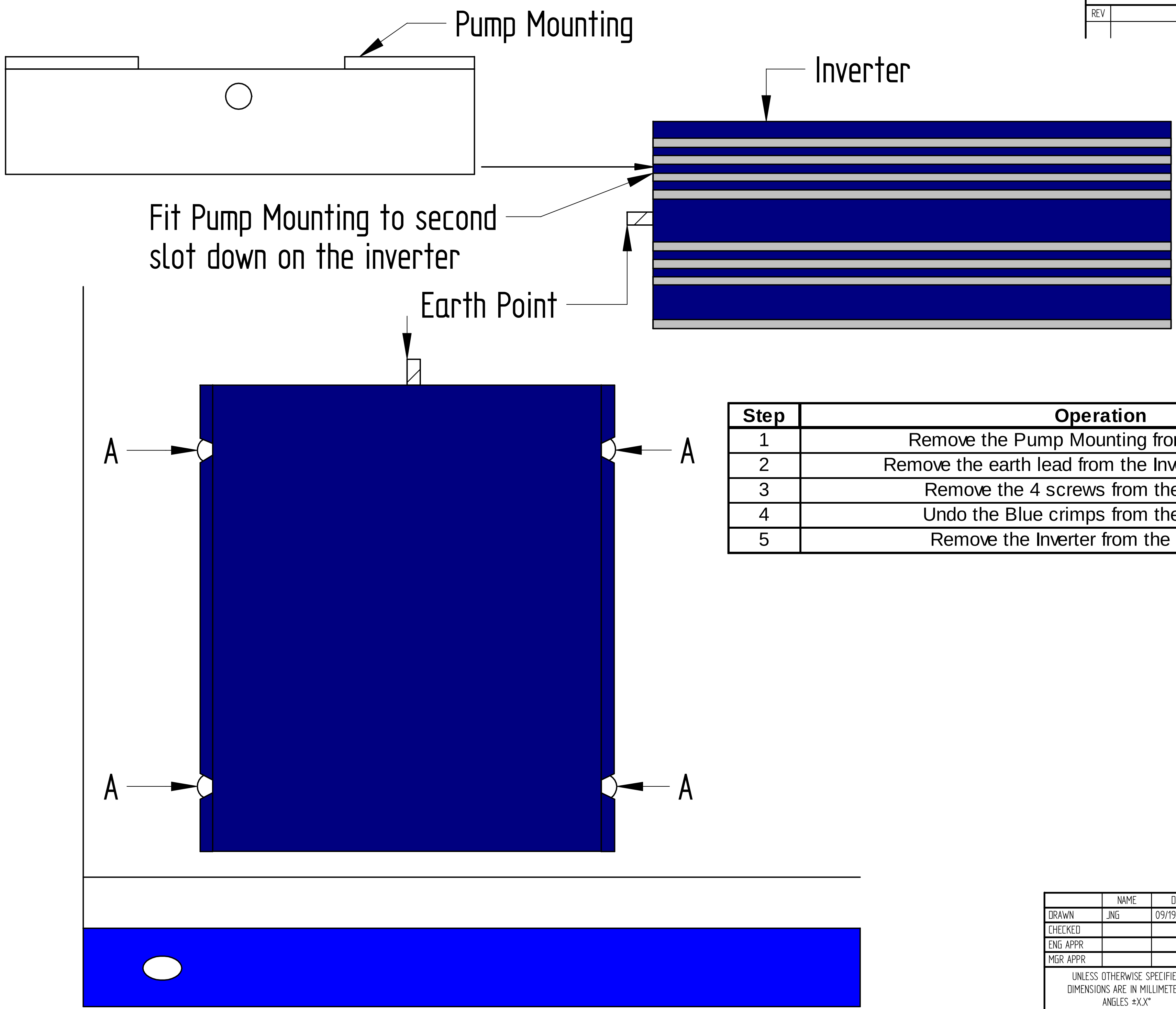
TITLE BwB Pump Assy

SIZE A2 | DWG NO BWBSM0006 | REV 1.0

FILE NAME: BwBservicePump.dft

SCALE: | WEIGHT: | SHEET 1 OF 1

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED



Step	Operation
1	Remove the Pump Mounting from the Inverter.
2	Remove the earth lead from the Inverter Earth Point.
3	Remove the 4 screws from the Inverter (A)
4	Undo the Blue crimps from the Air Switch.
5	Remove the Inverter from the Main Case.

	NAME	DATE
DRAWN	JNG	09/19/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

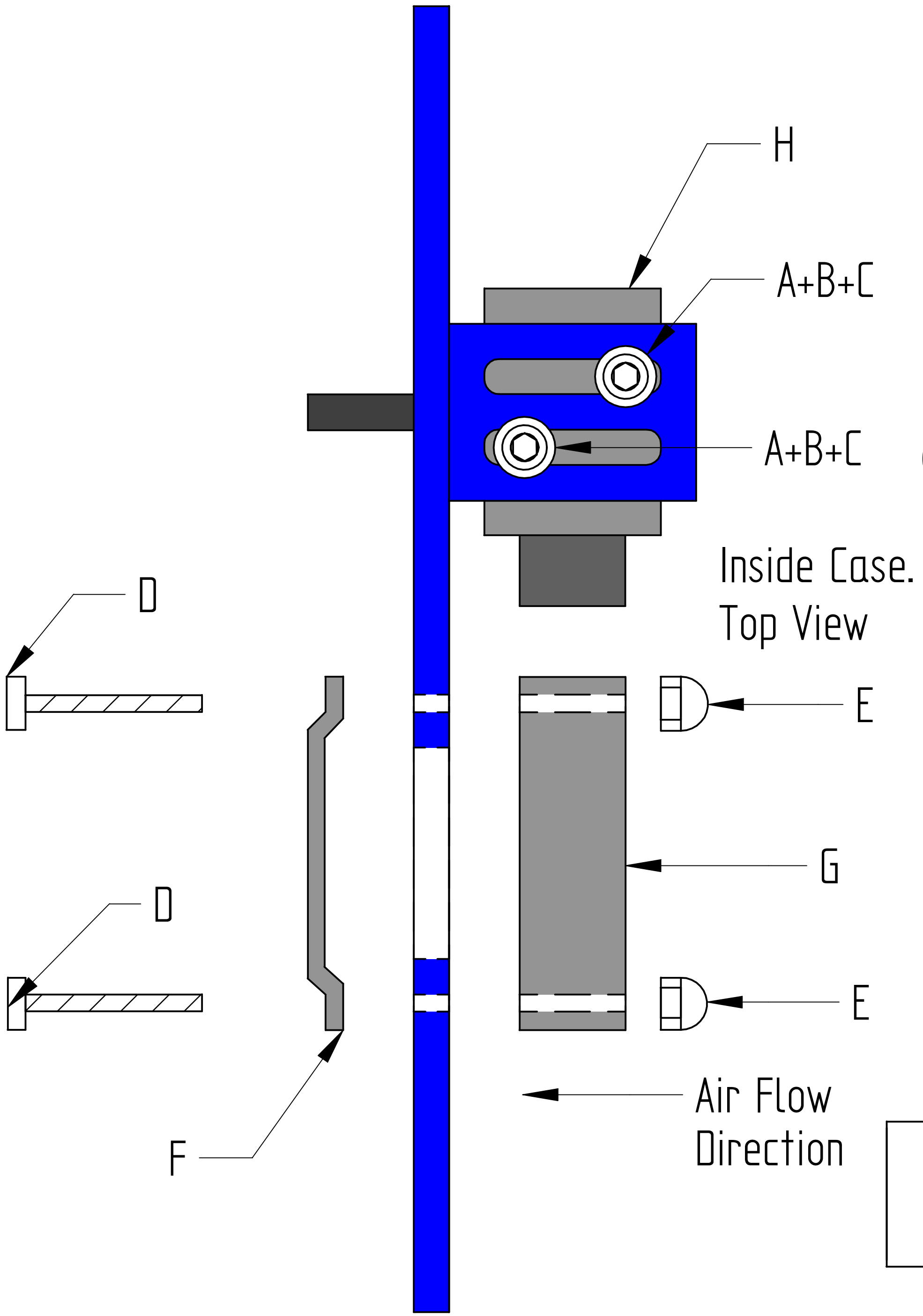
TITLE: Inverter Removal

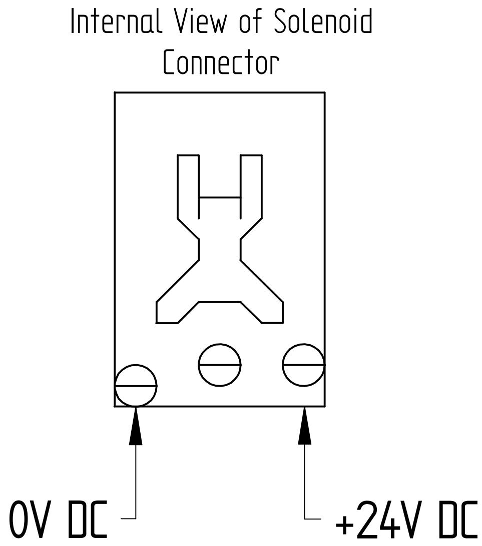
SIZE: A2 | DWG NO: BWBserviceInverter | REV: 1.0

FILE NAME: BWBserviceInverter.dft

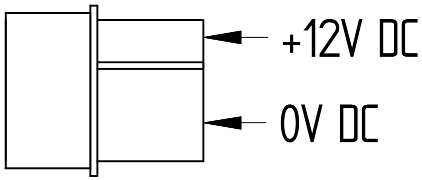
SCALE: | WEIGHT: | SHEET 1 OF 1

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED





Step	Instruction
	Fan Removal
1	Remove Screws (D) and Nylocs (E) from the Fan(G).
2	Separate the Fan Connector and remove the Fan from the Case.
	Solenoid Removal
3	Remove Screws (A) and Washers (B+C)
4	Disconnect the Solenoid (H) from the Gas Regulator.
5	Disconnect the Internal Gas Line.
6	Remove the Solenoid Connector from the Solenoid.



	NAME	DATE
DRAWN	JNG	09/23/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

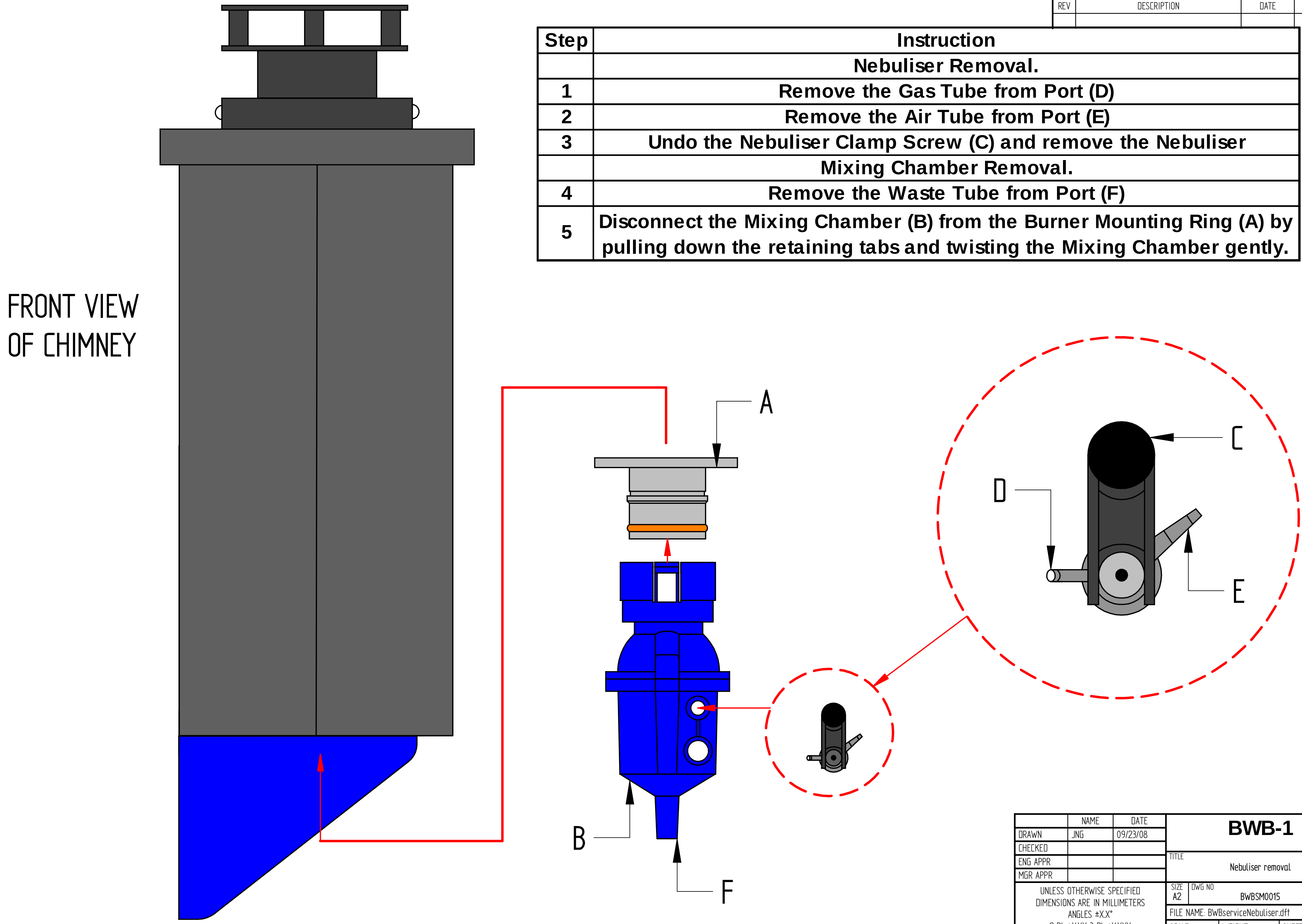
TITLE: Fan and Solenoid Removal

SIZE: A2 | DWG NO: BWBSM008 | REV: 1.0

FILE NAME: BwBserviceFanSolenoid.dft

SCALE: | WEIGHT: | SHEET 1 OF 1

Step	Instruction
	Nebuliser Removal.
1	Remove the Gas Tube from Port (D)
2	Remove the Air Tube from Port (E)
3	Undo the Nebuliser Clamp Screw (C) and remove the Nebuliser
	Mixing Chamber Removal.
4	Remove the Waste Tube from Port (F)
5	Disconnect the Mixing Chamber (B) from the Burner Mounting Ring (A) by pulling down the retaining tabs and twisting the Mixing Chamber gently.



REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

	NAME	DATE
DRAWN	JNG	09/23/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

TITLE: Nebuliser removal

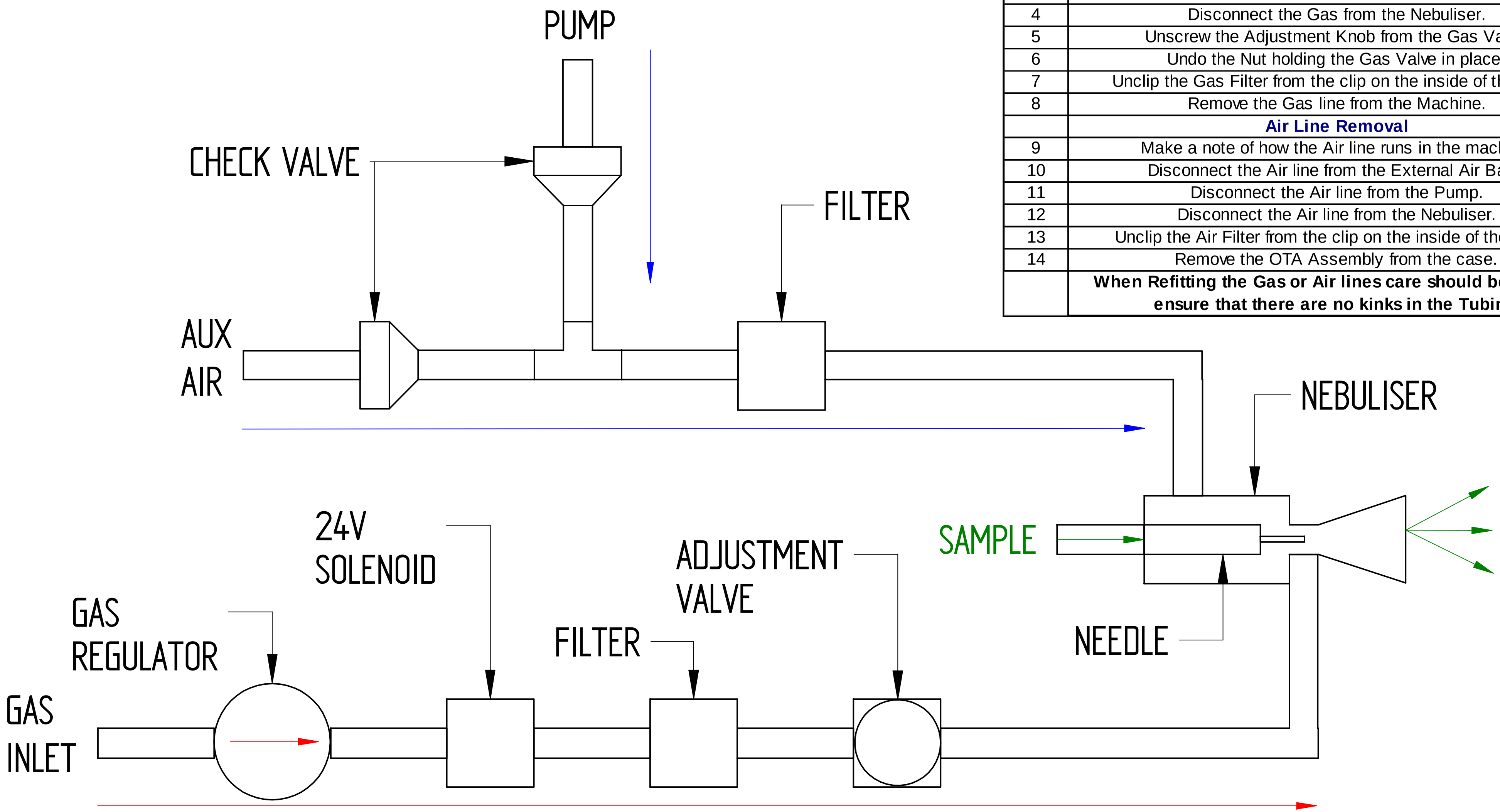
SIZE: A2 | DWG NO: BWBSM0015 | REV: 1.0

FILE NAME: BWBserviceNebuliser.dft

SCALE: | WEIGHT: | SHEET 1 OF 1

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

Step	Action
	Gas Line Removal
1	**Disconnect the Gas line into the machine.**
2	Make a note of how the Gas line runs in the machine!
3	Disconnect the internal Gas line from the Solenoid.
4	Disconnect the Gas from the Nebuliser.
5	Unscrew the Adjustment Knob from the Gas Valve.
6	Undo the Nut holding the Gas Valve in place.
7	Unclip the Gas Filter from the clip on the inside of the case.
8	Remove the Gas line from the Machine.
	Air Line Removal
9	Make a note of how the Air line runs in the machine!
10	Disconnect the Air line from the External Air Barb.
11	Disconnect the Air line from the Pump.
12	Disconnect the Air line from the Nebuliser.
13	Unclip the Air Filter from the clip on the inside of the case..
14	Remove the OTA Assembly from the case.
	When Refitting the Gas or Air lines care should be taken to ensure that there are no kinks in the Tubing.



AIR AND GAS FLOW DIAGRAM

	NAME	DATE
DRAWN	JNG	10/14/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

TITLE: Air and Gas

SIZE: A2 | DWG NO: BWBSM0014 | REV: 1.0

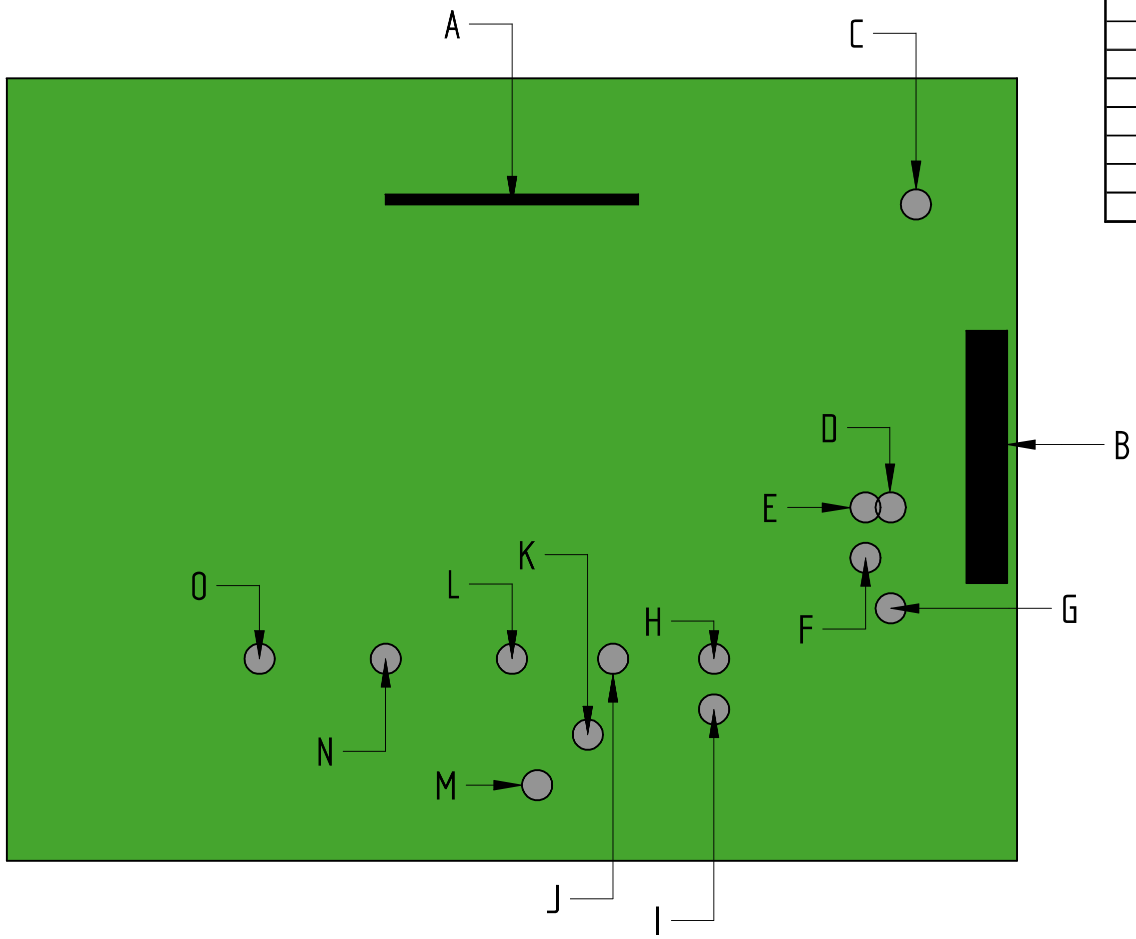
FILE NAME: BWBserviceAirGas.dft

SCALE: | WEIGHT: | SHEET 1 OF 1

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

Main Board Test Points

Key	Description
A	Conn 40
B	Conn 31
C	TP33 +5V DC
D	TP35 OTA Temp
E	TP36 Flame Detect
F	TP43 Digital Ground
G	TP40 +15V DC
H	TP32 -12V DC OTA
I	TP31 +12V DC OTA
J	TP41 0V DC Gas
K	TP34 U-Tube
L	TP39 +24V DC Gas
M	TP42 +5V DC
N	TP38 +9V DC
O	TP37 +12V DC



	NAME	DATE
DRAWN	JNG	10/14/08
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

BWB-1

TITLE
BWB-1 Main Board Test Points

SIZE A2 | DWG NO BWBMainBoardTP | REV 1.0

FILE NAME: BWBMainBoardTP.dft

SCALE: | WEIGHT: | SHEET 1 OF 1

BWB TECHNOLOGIES UK LTD

BWB-1 SERVICE AND REPAIR.
SECTION 6.
MAINTENANCE GUIDE.

6. Maintenance

6.1 General

To ensure optimum performance, periodic maintenance should be carried out according to this section. Maintenance consists of cleaning on a regular basis and occasional replacement of certain parts. There are no maintenance items inside the main enclosure. It is not recommended that the user enter the main enclosure unless servicing is called for.

NOTE: *Figures 6.7 to 6.14 show the two variations of the Burner, Nebuliser and Mixing chambers.*

6.2 Maintenance Menu

The Maintenance Menu is under the Welcome Menu. To reach the Maintenance Menu, scroll to it and press the "Accept" button. The Maintenance Menu has three options.

Run Compressor
Show Info
Reset Memory+Cal

To choose either option, scroll to it and press "Accept". To exit, press "Back".

<u>Air Compressor Only</u>

This is used when performing the Nebuliser Test (see Section 6.6). When activated, the air compressor will start but the instrument will not enter the Start Up routine.

<u>Show Info</u>

The BWB-1 has a timer that records the actual time (in hours) the instrument has been in use. It can be used as a reminder of when to perform maintenance.

<u>Reset Memory+Cal</u>

This resets all the stored calibration data.

6.3 Maintenance Schedule

The following are recommended intervals. Depending on the application they may be extended or shortened as needed.

<u>Daily or 8 hours:</u>

- Empty waste container, if used.
- Check "U" tube is filled with **tap** water.
- Clean Aspiration Needle and Aspiration Tubing.
- Clean any spills in tray.

<u>Weekly or 40 hours:</u>

- Carry out daily maintenance procedure.
- Check the operation of the Nebuliser (see Section 6.6).
- Check the Drain Cup, Mixing Chamber, Burner, "U" tube, Nebuliser, and waste tube. Clean as needed.
- For operations involving protein-containing samples, clean the Mixing Chamber, Aspiration Needle, and Aspiration tubing using a good quality de-proteinizing solution.

<u>Monthly or 200 hours:</u>

- Carry out weekly maintenance procedures.
- Check the air and fuel gas tubing and connections for leaks, using a soap solution. Also, check tubing for stress cracking. Replace as needed.

Semi-annually or 1000 hours:

- Carry out the monthly maintenance procedures.
- Clean the Mixing Chamber, Burner, Nebuliser, and Drain Cup.
- Remove the Inner Chimney. Clean the Inner and Outer Chimneys, as needed, and clean the Chimney Windows.
- Clean the Optical Train Assembly Window.
- Replace “U” tube and waste tubing.

Annually or 2000 hours:

- Carry out the semi-annual maintenance procedure.
- Inspect and replace, as needed, gas tubing, air tubing, and Spark Igniter. See appropriate parts of this Service Manual.

6.4 “U” Tube

The “U” tube must be as supplied and remain free of obstructions or “pinching” that might inhibit waste flow out of the Mixing Chamber. For the start sequence to ignite the flame, the “U” tube must be filled to overflowing with **tap** water (or deionised water with a little salt added to increase conductivity).

To clean, use a detergent solution with subsequent thorough rinsing with tap water. **Do not use organic solvents.** They may swell the tubing material rendering it useless.

6.5 Aspiration Needle and Aspiration Tubing

The heart of Nebuliser function, the Aspiration Needle should be cleaned whenever the functionality of the instrument is in question. Cleaning every so often throughout the day usually keeps blockage to a minimum and is best done by aspirating diluent solution for a few minutes. More severe cleaning can be had by running Cleanout Wire through the inside of the needle and/or long term soaking in a detergent solution.

6.6 Nebuliser

The Nebuliser needs periodic testing for functionality and cleaning.

Testing:

1. Ensure the Needle and Aspiration Tube used for the test are clean and free of obstructions.
2. Unscrew the Nebuliser Retaining Clip and remove the Nebuliser from the Mixing Chamber.
3. Turn on the power to the instrument.
4. From the Welcome Menu, choose Maintenance Menu.
5. From the Maintenance Menu, choose Air Compressor Only to start the air compressor.
6. Aspirate deionised water.
7. Measure the aspiration rate by timing how long it takes to aspirate a known amount of water. The aspiration rate should lie within 1-4 millilitres/minute.
8. Observe the mist. It should consist of fine droplets extending about 15-20 cm. Larger droplets will also be emitted. This is normal.
9. If the aspiration rate is too low or there is no fine mist, the Nebuliser needs cleaning.

Note: *If alternate air supply is being used, there is no need to do steps 3,4,and 5 above. Just turn on the alternate air.*

Cleaning:

1. Unscrew the Nebuliser Retaining Clip and remove the Nebuliser from the Mixing Chamber.
2. Remove the air supply tube, gas supply tube and aspiration tube.
3. Use Cleanout Wire to remove any obstructing materials from the centre hole and small side hole. *Be very careful to not abrade the surfaces of either hole!*
4. Soak all the Nebuliser pieces in a good detergent solution.
5. When fully clean, rinse all the Nebuliser pieces very, very well with deionised water. Allow to dry.
6. Assemble the Nebuliser.
7. Test the cleaned Nebuliser as above.

6.7 Drain Cup

The Drain Cup has a sensor that the software monitors during the Start Up cycle to ensure that the "U" tube is filled with water. For the sensor to operate, the water must have some conductivity. Normal tap water will provide the correct level of conductivity. Always be sure that the inner tube is filled to overflowing. See Figure 6.1. The only maintenance needed is occasional cleaning.

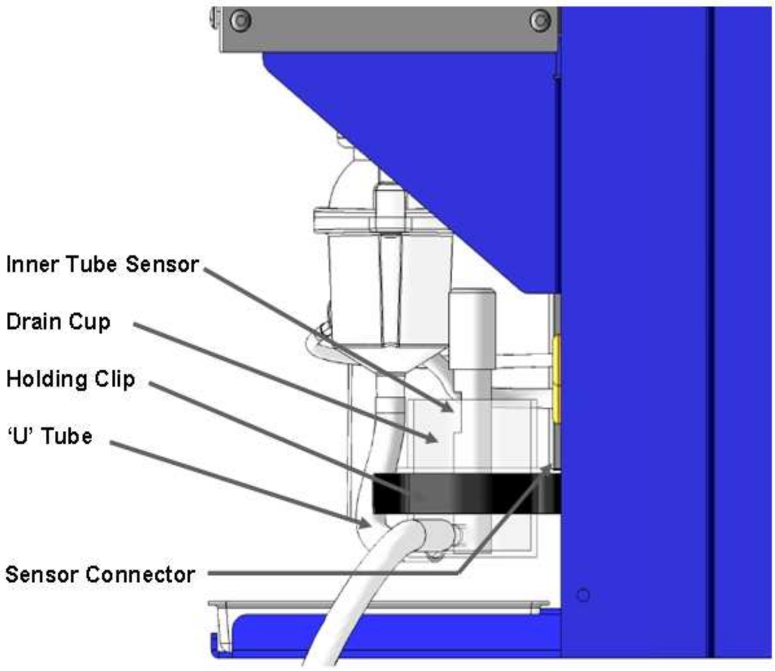


Figure 6.1

Cleaning:

- **Unplug the power cord.**
- Remove Drain Cup from the holding clips.
- Remove "U" tube and waste tube.
- Disconnect Sensor connector at the Drain Cup.
- Clean with a detergent solution, mild acid, or Decon 90. **Do Not use Alcohol as it may damage the Drain Cup**. Rinse thoroughly with water. *Avoid getting any solutions on the lead or connector! If the lead or connector gets wet, allow to completely dry.*
- When dry, reattach the sensor connector.
- Reattach the "U" tube and waste tube. Fit back onto the holding clips. *Be sure that the top rim of the Drain Cup sets on the top clip so that the inner overflow tube is even with the drain opening of the Mixing Chamber.* See Figure 6.1.

6.8 Mixing Chamber

The only maintenance the Mixing Chamber assembly needs is occasional cleaning and O-ring replacement.

Warning: The Mixing Chamber/Burner must be completely cool before proceeding further!

Cleaning:

- Remove Nebuliser from Mixing Chamber (see Section 6.6).
- Remove "U" tube from Mixing Chamber.
- Gently spread the Release Tabs just enough to clear the groove they are in and pull the Mixing Chamber down. See Figure 6.2.
- Separate the Mixing Chamber halves by undoing the two screws that hold them together.
- Clean all parts with a detergent solution, de-proteinizing solution, and/or Decon 90. **Do Not use organic solvents or Alcohol - they will damage the Mixing Chamber body!** Rinse all parts well with deionised water.
- Inspect, and replace if necessary, the O-ring between the two halves.
- Reassemble in the reverse order. Be careful to not damage the Release Tabs.

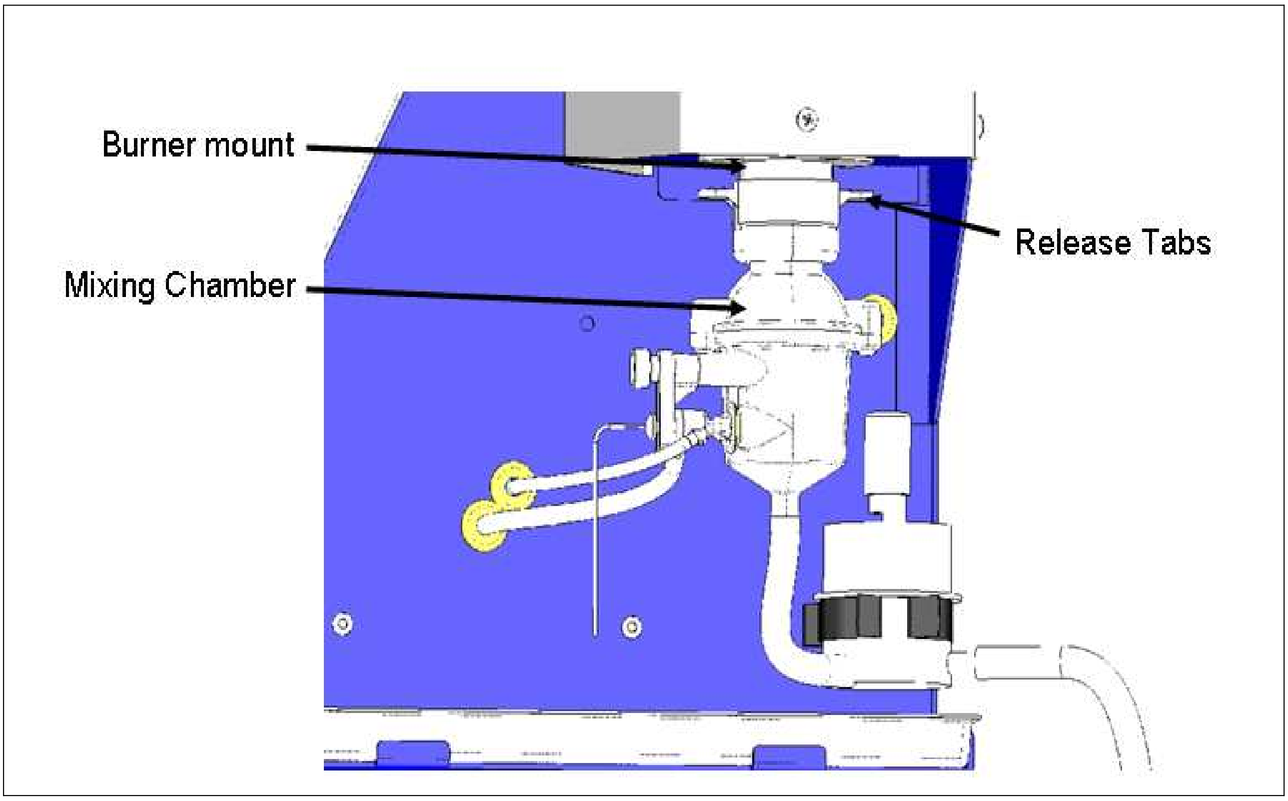


Figure 6.2

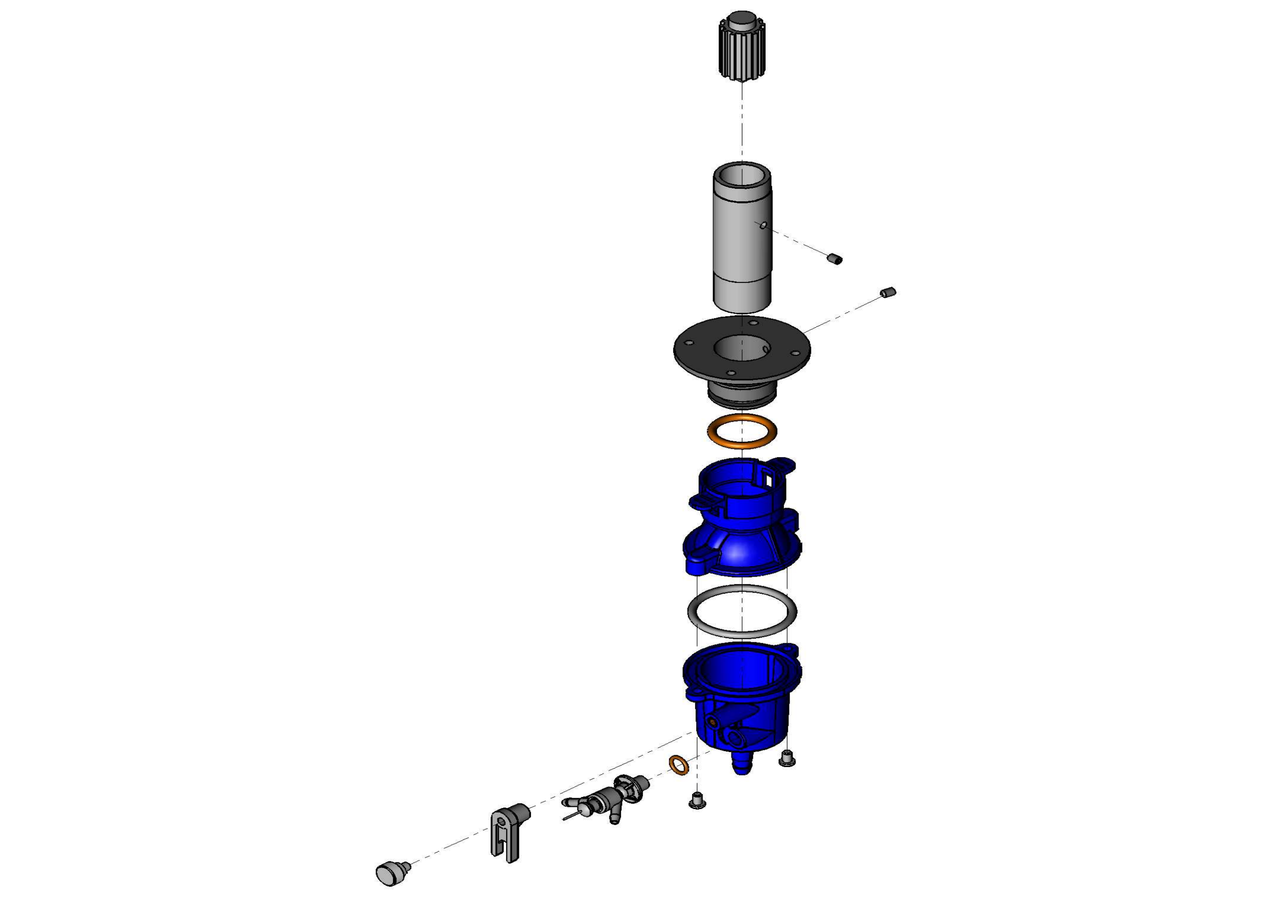


Figure 6.3

6.9 Burner

The only maintenance needed on the Burner is occasional cleaning.

Warning: The Mixing Chamber/Burner must be completely cool before proceeding further!

Cleaning:

- Remove the Chimney Back Piece and the Inner Chimney (see Section 6.10).
- Undo the set screw on the Chimney Mount (see Figure 6.3) and lift the Burner Tube up and out.
- Clean with a detergent solution, Decon 90, or mild acid. Rinse thoroughly with deionised water.
- If needed, the Flame Spreader may be removed via the set screw on the side.
- Reassemble in the reverse order.

6.10 Chimney

The only maintenance needed on the Chimney is occasional cleaning.

Warning: The Chimney assembly must be completely cool before proceeding further!

Cleaning:

- **Unplug the power cord.**
- Remove the Chimney Back Piece.
- Slide back the boot and disconnect the lead to the Spark Igniter.
- Remove the two screws holding the Inner Chimney to the Top Piece. See Figure 6.4.
- Lift the Inner Chimney assembly up and away from the Outer Chimney. *Be very careful to not damage the Spark Igniter.*
- If needed, remove the Spark Igniter from the Inner Chimney.
- Remove the Chimney Windows from the Inner Chimney by undoing the screws on the Window Holders. See Figure 6.5.
- Clean the metal and glass parts of the Inner Chimney with gentle scrubbing using a detergent solution. *Do Not scratch the glass windows nor scrub off the paint on the Chimney pieces.*
- If needed, the Outer Chimney Top Piece/Heat Shield assembly can be removed. Gentle scrubbing with a detergent solution can clean both this assembly and the Outer Chimney Body.
- Reassemble in reverse order.

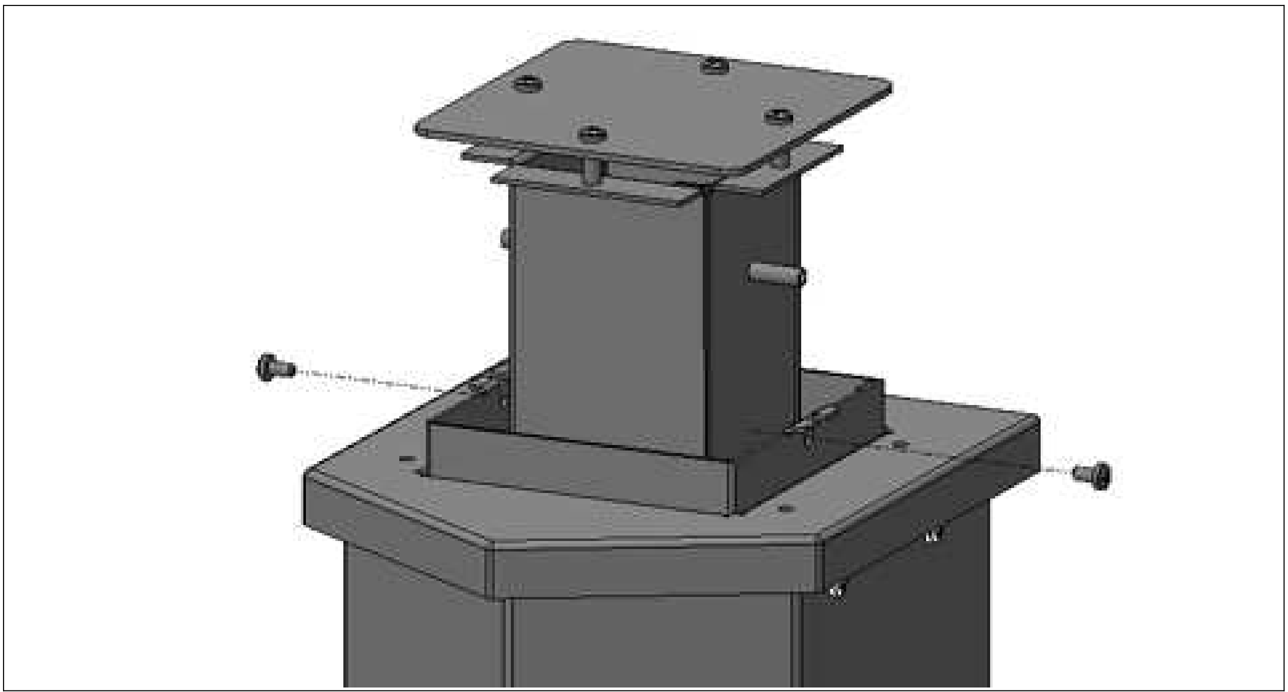


Figure 6.4

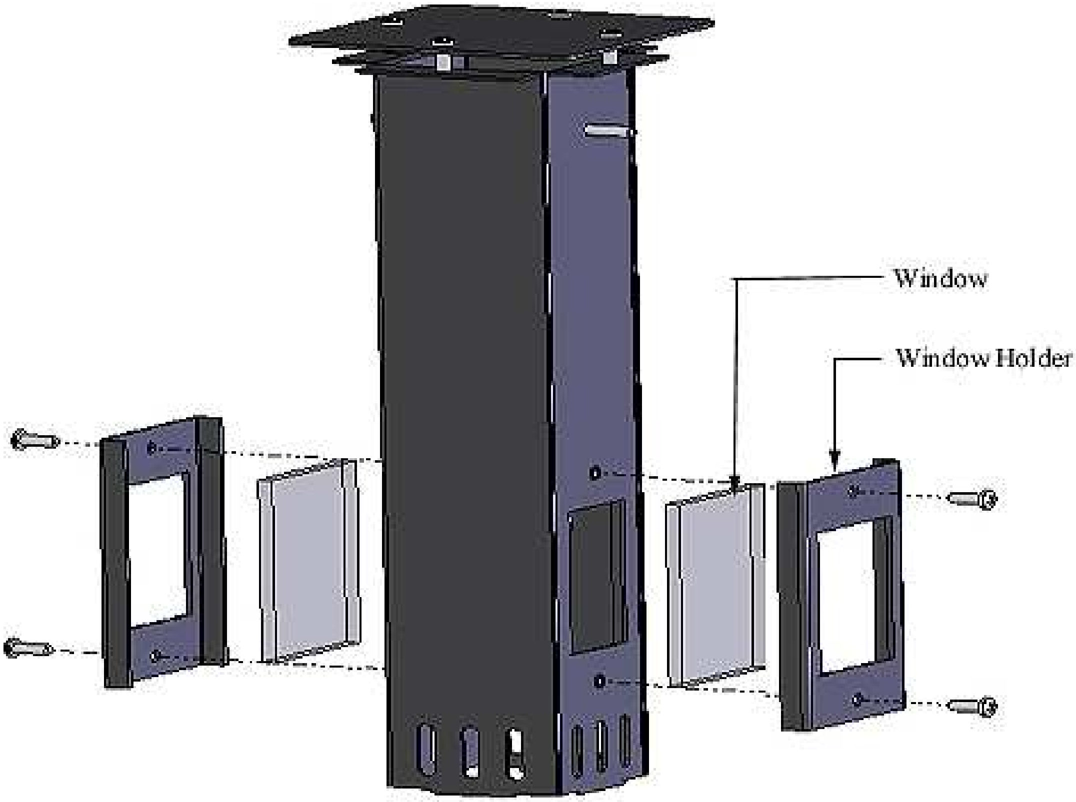


Figure 6.5

6.11 Optical Train Assembly

The only maintenance that can be done with the Optical Train Assembly is to clean the window.

Warning: The Chimney assembly must be completely cool before proceeding further!

Cleaning:

- **Unplug the power cord.**
- Remove the Chimney Back Piece.
- Reach into the Outer Chimney and clean the window *very* gently using a *very* soft cloth or cotton swab soaked in Decon 90. See Figure 6.6.
- Reassemble the Chimney Back Piece.

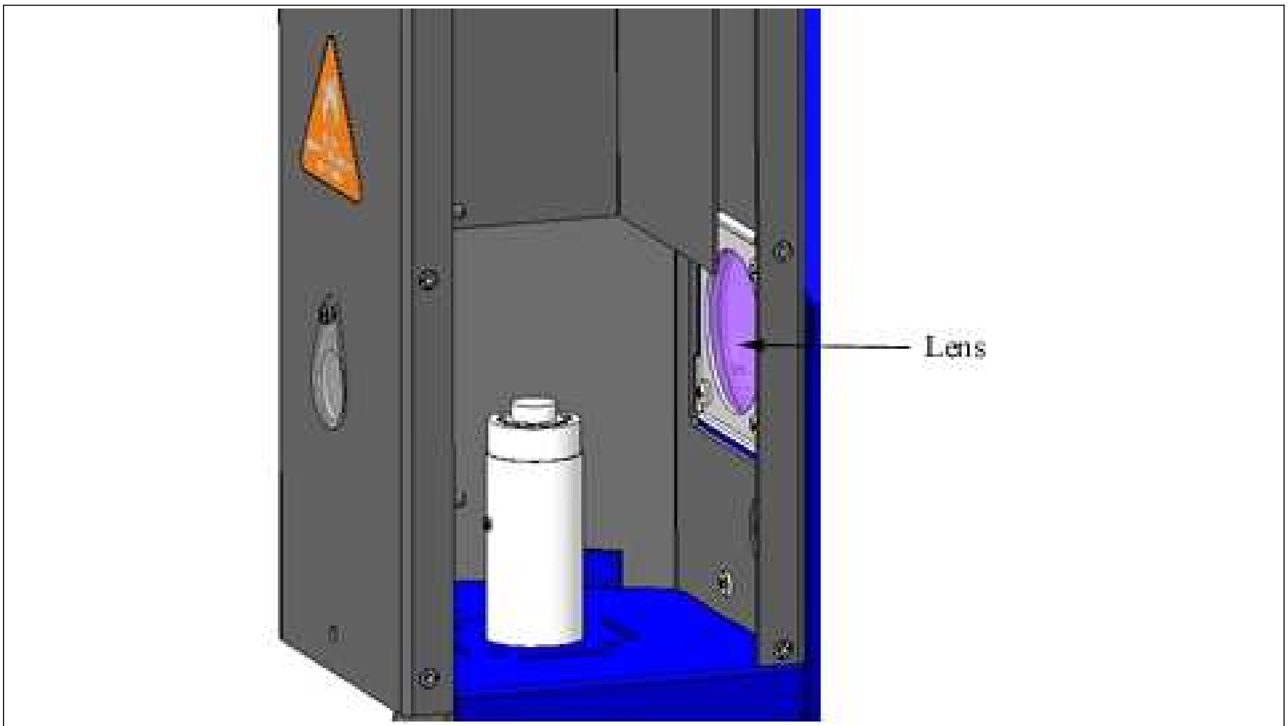


Figure 6.6

6.12 Replacing the Fuse

Before replacing the fuse unplug the power cord! The fuse is located on the rear panel as part of the Power Input module. Using a small flat screwdriver turn the cap to the left. *Always use the correct fuse.*

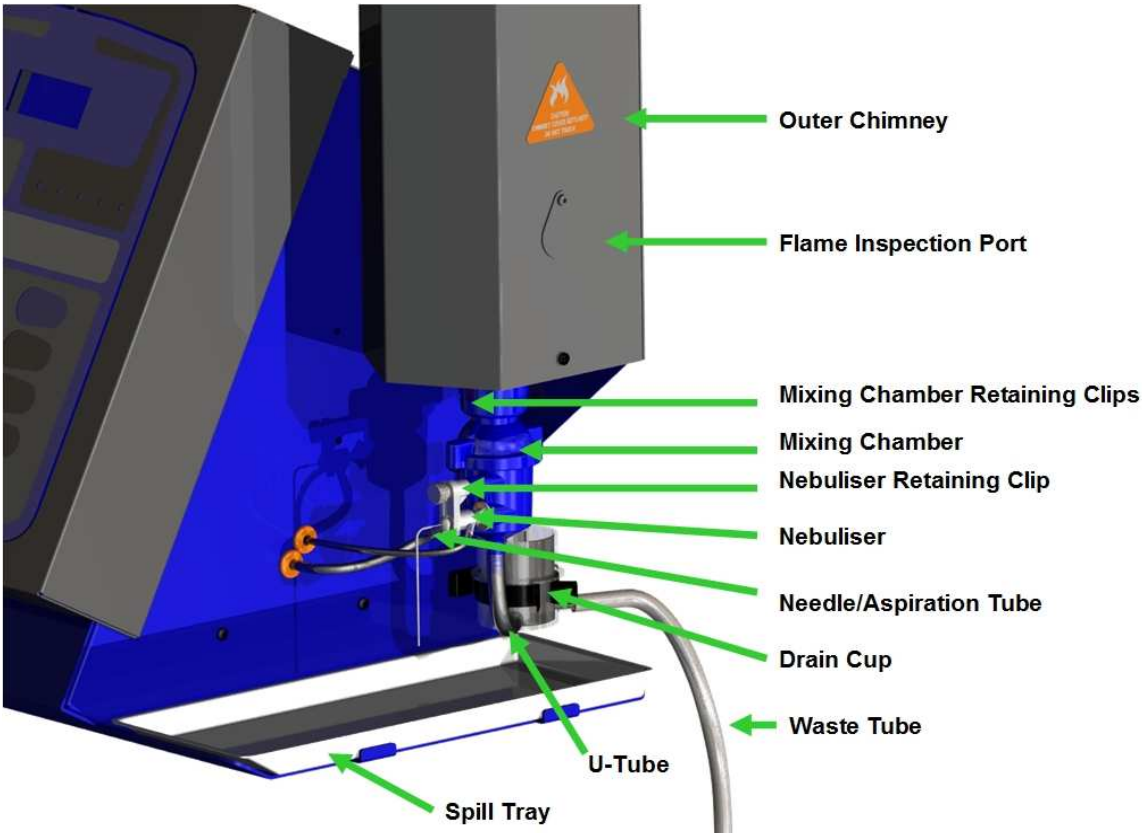


Figure 6.7 MK2 Mixing Chamber and Nebuliser.

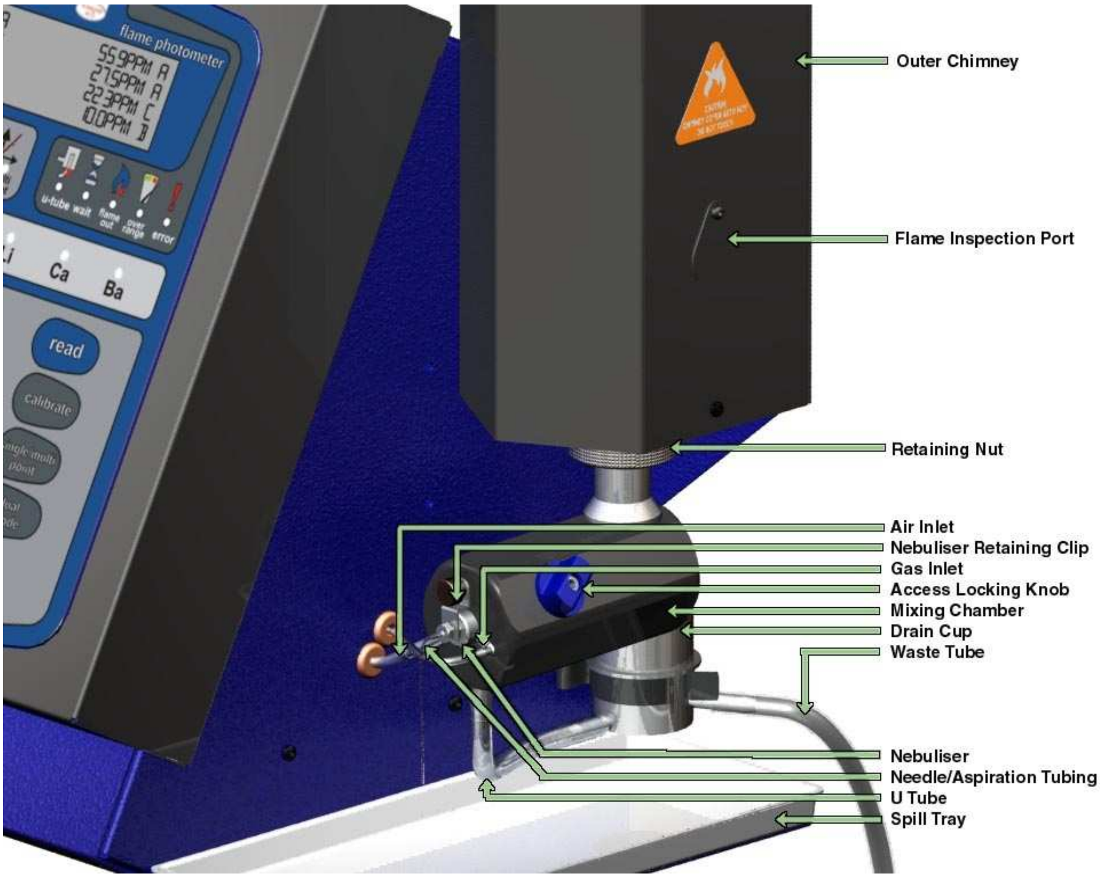


Figure 6.8 MK1 Mixing Chamber and Nebuliser.



Figure 6.9
MK1 Mixing Chamber and Burner Assembly

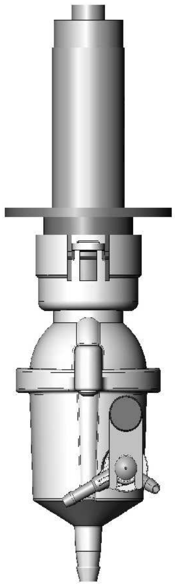


Figure 6.10
MK2 Mixing Chamber and Burner Assembly

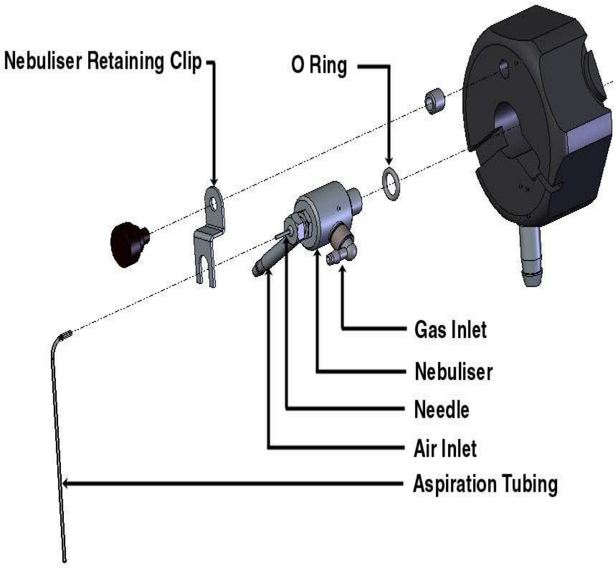


Figure 6.11
MK1 Nebuliser.

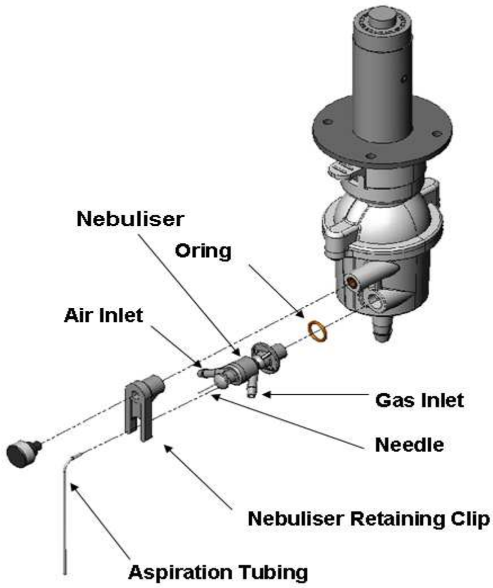


Figure 6.12
MK2 Nebuliser.

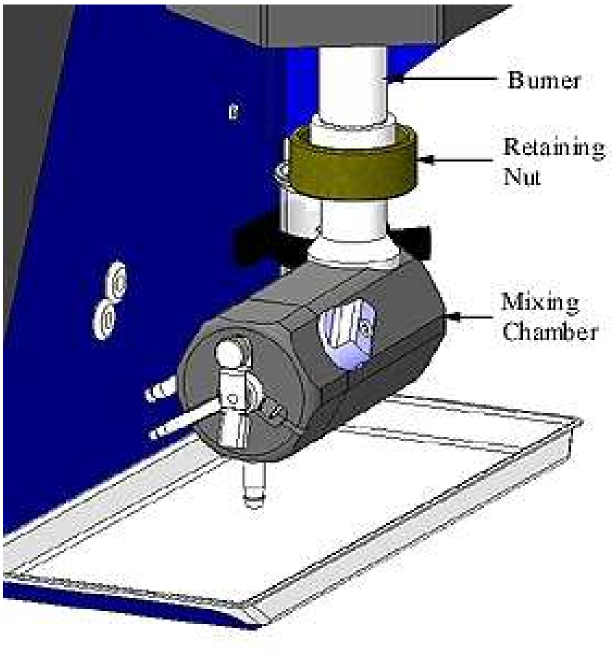


Figure 6.13
MK 2 Mixing chamber in position.

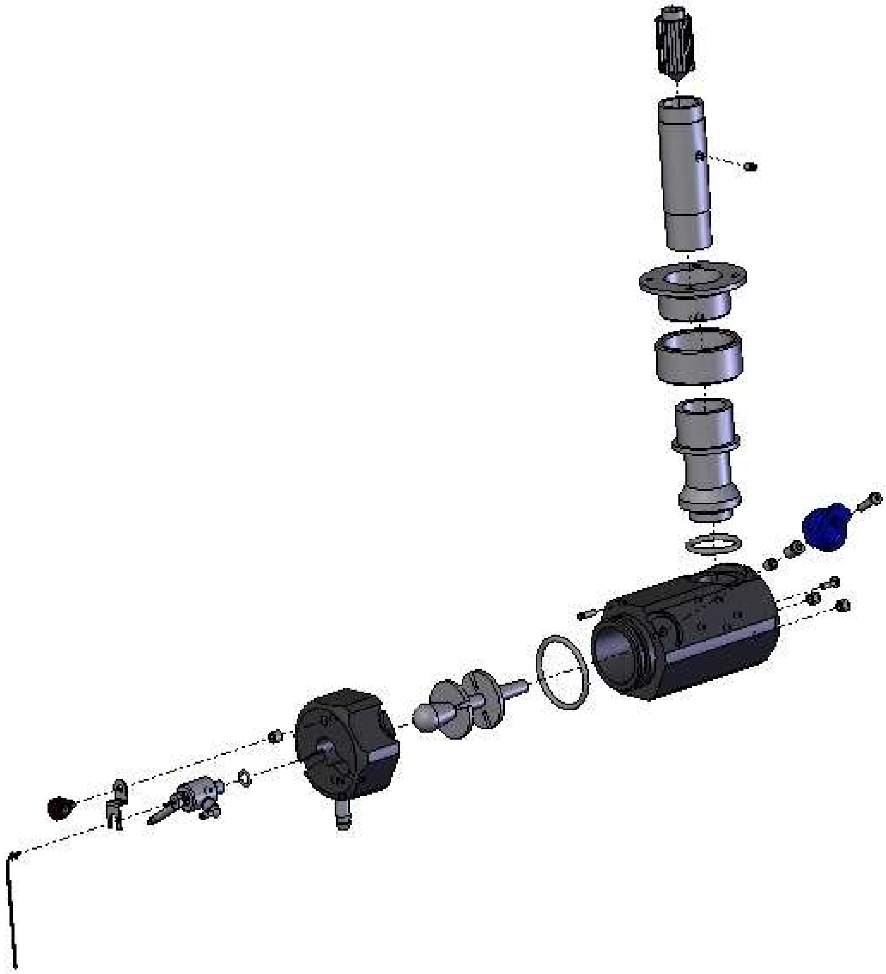


Figure 6.14
MK1 Mixing Chamber, Nebuliser and Burner assembly exploded diagram.

